ELECTRICAL REVIEW

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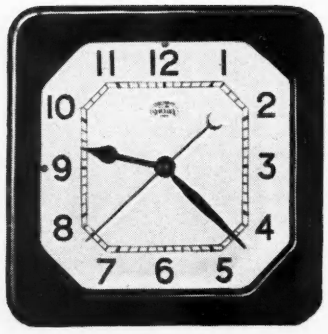

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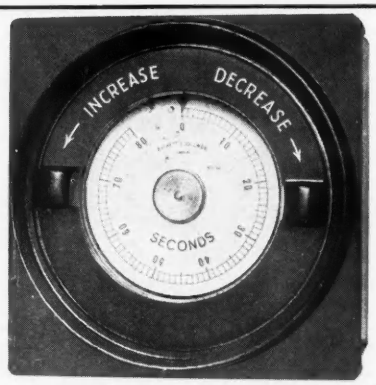

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ELECTRICAL REVIEW

26 March 1954 Vol. 154 No. 13 Established 1872

Canadian Aluminium Industry

WITH a water-power potential of well over fifty million horse-power, only a quarter of which is developed, Canada is in a more fortunate position electrically than most countries and this is reflected particularly in her aluminium industry. Although the country lacks the raw materials necessary for producing this metal it possesses ready access to ocean transport and because of the vast amount of hydro-electric power which is available Canada has become the second largest producer of aluminium and the world's leading exporter.

During this century the Canadian aluminium industry has made three major moves into undeveloped areas to find conditions favourable for aluminium production; first in 1900 to Shawinigan Falls, Quebec, and then in 1925 to the Saguenay Valley, farther to the north. In 1951 the largest enterprise of all was launched on the west coast of British Columbia by the Aluminum Company of Canada, Ltd., the principal subsidiary of Aluminium, Ltd., and a description of the electrical side of this project is contained in an article in this issue.

The watershed selected was 125 miles long on a rugged plateau of heavy rainfall and heavy snowfall. The waters drained eastwards but it was necessary to develop their hydro-electric potential at the western end of the system to take advantage of the half-mile drop to sea level and of a smelter site close to ocean transport. This reversal of flow has been made possible by building a dam, 317ft high with a crest 1,550ft long by 40ft wide, on the Nechako River at the eastern end of the watershed, the water then being backed up in a series of lakes and rivers towards the mountain range 125 miles to the west. Two tunnels through these mountains link the reservoir to the generating station in the base of the mountain, the gross head thereby created, under average reservoir level, being 2,585ft.

This makes Kemano by far the largest high-head hydro-electric plant in the world and with an ultimate capacity of 2,240,000 h.p. it has roughly double the output of any other hydro-electric generating station. The second largest high-head plant is Shipshaw No. 2 on the Saguenay River, which has a capacity of 1,200,000 h.p. and was also built by the Aluminum Company of Canada, Ltd. The station at Kemano is exceeded in capacity only by the Grand Coulee scheme in the United States where two stations, one on either side of the river, have a total installed capacity of 3,102,000 h.p. However, the storage reservoir capacity is only about half that of the Nechako-Kemano scheme, which as a consequence has the higher annual firm energy generation. Some idea of the magnitude of these schemes can be gathered from the fact that the largest hydro-electric station in the North of Scotland is Loch Sloy, which has an installed plant capacity of 130 MW and is a peak load station.

From Kemano the power is transmitted at 300 kV to the smelter at Kitimat, fifty miles away. This will have an initial annual capacity of 83,000 metric tons and an ultimate objective of 500,000 metric tons which will double Canada's present output of aluminium. At Kitimat also, a town is being built to house the company's employees and the necessary electricity supply will be derived from Kemano. It will not be purely a "company" town but a balanced community, ultimately of about 50,000 people.

E.D.A. REDIVIVUS

Since the Minister of Fuel and Power announced last year that restrictions upon the domestic development activities of the electricity and gas industries were no longer to operate there has not been quite so much anti-electric progaganda. It was principally this which gave successive Ministers the erroneous idea that suppression was in the national interest. Now the atmosphere is much more favourable to electricity just as, reciprocally, electricity is much more favourable to the atmosphere. Thus the Electrical Development Association is choosing a good moment for launching its great new domestic electrification campaign and it is practically certain of fruitful results. The basis of the campaign is widespread Press advertising in which the " Four Foundations of Modern Living "—electric cooking, water heating, laundering and refrigeration—are attractively presented. The " coverage " is such that hardly anybody in the country will fail to see the announcements, particularly as the Electricity Boards will doubtless follow up the E.D.A. efforts in their local newspapers. Not only will the electricity supply industry benefit; manufacturers and contractors will also derive a great deal of business from it and should give the campaign their active support.

ELECTRONIC CONTROL

Elsewhere in this issue we publish an article dealing with the principles of operation of an electronic system of control which has been devised for installation at the Aden oil refinery of the Anglo-Iranian Oil Co., Ltd. This is a further addition to the sizable list of applications of electronic control to industrial processes which we have described, including steel rolling, coal winding, paper making, etc. Electronic methods afford a degree of flexibility in both measurement and control impossible with any other system. Product variables such as density, viscosity, humidity and conductivity, and many forms of analysis, are all expressed electrically and signals from the quality detectors can readily be fed into the desired valve circuits either directly or through a computing circuit for dealing with multi signals.

ATOMIC ENERGY AND SECRECY

Ever since it seemed likely a few years ago that a major medium through which atomic energy would be used for peacetime purposes would be normal electricity supply we have sought information relating to the actual transference of energy from the nuclear reactor. The need for secrecy in relation to the actual production and control of nuclear energy proper is understandable because of the country's security requirements, but it is difficult to see why information relating merely to the transfer of heat from the reactor to the steam generator should be withheld. We put this point to a responsible officer of the new Department of Atomic Energy recently and his sympathy with our problem prompted him to give us the name of a manufacturing company which is producing plant of the type indicated and to suggest that we should write to the company for information. We did so, but the reply was to the effect that the company was not prepared to give information at this stage. Such a refusal to impart information relating to broad principles rather than to " trade secrets " can mean either that the company is unaware of the extent to which it may reveal information or that it is reluctant to do so for other reasons and neither of these possible conditions is conducive to progress. On the stand of the Department of Atomic Energy at the Electrical Engineers' Exhibition last week there was displayed a drawing depicting the method of heat transfer from the nuclear reactor to the steam generator at the new Calder Hall power station, Cumberland. The transfer appears to be made by a gas flow in a closed circuit embracing both the reactor and the steam generating system which are widely separated.

WHOLESALERS—AND OTHERS

Of all sections of the electrical industry the wholesalers suffer the greatest uncertainty. They are too often regarded as superfluous intermediaries who by taking a percentage add to the ultimate cost of products to the consumer. There are certainly many so-called " wholesalers " who fit this description but the genuine wholesaler serves a useful purpose and can actually reduce distribution costs. This is recognized by their inclusion in the Electrical Fair Trading Council. Inevitably a statement for the defence is made at each annual dinner of the Electrical Wholesalers' Federation and at last week's Mr. E. A. V. Peckham, the president, returned to the subject. He maintained that it was economically proper for manufacturers to stick to production and leave distribution to the specialists. This is true, except perhaps in the special case of a large manufacturer of a wide range of goods. A wholesale establishment to give proper service must offer the varied products of many manufacturers. That is why manufacturers should be careful to whom they accord wholesale terms.

REFRIGERATION BUSINESS

In his " swan song " at last week's annual luncheon of the British Refrigeration Association Mr. E. G. Batt, the retiring director, was more optimistic about the position and prospects than he was last year. Of course the irritations of purchase tax remain in spite of the alleviation granted last year. In the case of such comparatively costly equipment as the refrigerator the constant possibility of sudden changes in the rate of tax is a serious matter. The " sale-or-return " method has been permitted to the suppliers but, as Mr. Batt said, this is the worst possible form of trading for the manufacturers. An alternative system has been proposed by a number of trade associations but so far the Chancellor has not pronounced upon it. Another matter raised by Mr. Batt was the strange arrangement by which sheet steel, denied in sufficient quantities to refrigerator makers, is being exported to the Continent, probably to find its way, in the shape of finished products, into markets in which we find it hard to compete.

POWER FOR ALUMINIUM PRODUCTION

The Nechako-Kemano-Kitimat Development in Canada

THE Nechako-Kemano hydro-electric scheme in British Columbia, Canada, with the power transmission facilities and the aluminium reduction plant at Kitimat, marks an outstanding advance in the industrial development of aluminium, the most widely used non-ferrous metal. It will be the largest underground power development in the world, having a firm capacity of over three times the installed capacity of the Swedish Harspranget scheme. Furthermore, the Kitimat plant will be the world's biggest aluminium smelter.

The scheme is situated in the Coast Range country, with water access about 500 miles from Vancouver and 180 miles from Prince Rupert. On the western slopes of the Coast Range mountains most of the valleys reach sea level close to or somewhat east of the crest, constituting great fjords sharply indenting the coast line. Large valleys on the eastern slopes of the range are occupied by long, narrow and deep lakes, with western extremities close to the crest, extending out over the interior plateau. This unusual topographical development creates the water-power potential.

Storage Reservoir

Referring to Fig. 1, the Kenney rockfill dam, which is the third highest of its type in the world and is 16 miles downstream from Natalkuz Lake on the Nechako River, permits impounding the run-off of the Eutsuk-Tetachuck-Euchu and Tahtsa-Whitesail-Ootsa-Natalkuz drainage systems at full reservoir level 2,800ft above sea level. This enables the flow to be reversed westwards through Tahtsa River and Lake, and diverted through two power tunnels, ten miles long and 25ft in diameter, piercing the Coast Range, instead of pursuing its normal course through the Nechako River to the Fraser River and thence to the Pacific at Vancouver. From the power tunnels the water passes through pressure conduits to the impulse turbines and thence to the Kemano River.

With the storage reservoir created by the Kenney dam providing 873×10^9 cu ft capacity, and an average total run-off of 7,470 cu ft/sec, it will be possible to utilize a regulated flow of 6,920 cu ft/sec through the turbines. The annual average reservoir level will be at an altitude of 2,795ft, overall variation being about 6·5ft under average conditions, and about 17ft under minimum water conditions. Since the turbines are installed with a nozzle setting at 210ft above sea level, the gross head under average reservoir level is 2,585ft, which is 16 times that of Niagara. From the head and regulated-flow figures it is estimated that 1,718,000 h.p. can be developed. However, it will be possible to maintain 2,240,000 h.p. over considerable periods of time.

The generating plant (see Fig. 2) will be housed in a chamber 1,135ft long by 81ft wide by 134ft high excavated from the solid rock of the mountain mass, located about 1,400ft in from the face of the mountain. On the operating floor, the passageway under the busbar gallery provides access to the only operating position at each unit. Here are grouped together the governor cabinet, the generator brake controls and the field cubicle structure which contains the generator- and exciter-field circuit breakers, the motor-operated rheostat and contactors, the pilot-exciter field rheostat, the a.c. and d.c. distribution panels for the unit, the control station for the cooling-water pump for each unit, and the generator and turbine-bearing temperature indicators, as well as the unit bay-lighting panel.

For the particular head, the largest four-nozzle vertical single-runner impulse turbines it is feasible to build, with optimum characteristics, are units with a rating of 140,000 h.p. and an anticipated maximum output of 150,000 h.p. each. Thus 16 units operating at rated output are required to generate 2,240,000 h.p.; the first three are being constructed by different firms. The turbine governors are actuated from permanent-magnet generators and each turbine is protected against overspeed and loss of governor-oil pressure, and is equipped with bearing temperature, oil-flow and water-flow alarm devices.

Underground Generating Station

The hydraulics of the power tunnel and the pressure-conduit system, as reflected in pressure surges, necessitate the use of a minimum turbine-nozzle needle-opening time

of about 30 sec. Initially, operating requirements involve picking up two 100 MW blocks of load, one at a time, and carrying this load on a minimum of two generating units. This requirement has been met by providing a pre-set needle-opening solenoid actuated from the control room.

The generators are vertical three-phase 60 c/s, 22-pole, 327 r.p.m., 13·8 kV, 0·8 power factor machines rated at 106 MVA at 60 deg C or 122 MVA at 80 deg C, and are designed for 610 r.p.m. overspeed. They are equipped with direct-connected main and pilot exciters, with the voltage regulators actuating motor-operated rheostats in the main exciter-field circuits. Thrust and upper guide bearings are located above the rotor and a lower guide bearing below it. The generators may be operated with the stator winding neutral either solidly earthed or earthed through a loaded distribution transformer. Three firms are each building one machine to be installed initially.

On the generator and transformer floor the available space accommodates two transformers between each pair of generating units, at 60ft centres. These step-up transformers comprise double-primary banks of three single-phase units, each with a normal rating of 71 MVA or 213 MVA per bank. They are forced-oil water-cooled and are equipped with two 100 per cent capacity coolers, operation of both coolers boosting the capacity. The transformers have no ratio adjusters and they are connected delta-delta-star, the voltage ratings being 13·2/13·2/301·4 kV. Each primary winding can carry its full rated load independently of the other. The h.v. windings are built with an impulse insulation level of 1,050 kV, graded to 15 kV at the solidly earthed neutral. Busbar connections between the generators and transformer primary windings are designed for 6 kA capacity, and consist of 7in double aluminium channel, mostly with welded joints. Two different makes of transformers are being installed initially.

The generator circuit breakers were somewhat of a problem, since the current capacity had to be at least 5·5 kA; although in the initial installation only three circuit breakers are necessary, to secure them with the requisite capacity would have entailed development charges and high costs, with possible delays and difficulties. The solution adopted involves the use of two standard 15 kV, 4 kA, 1,500 MVA air-blast circuit breakers operated as a single electric and pneumatic unit. One of each of the six poles in the combination is used in each of the six phase leads from the generator, the phase parallels being connected on the transformer side of the circuit breaker. This solution provides an effective capacity of 8 kA, at an economic cost. In addition, the use of an air-blast type eliminates the oil-fire hazard. Low-voltage disconnecting switches are designed for a capacity of 6 kA.

The location of the step-up transformers in the underground generating station necessitates the transmission of the output of the transformers to the 300 kV switching station through h.v. power cables. The output of each step-up bank is being carried by three paper-insulated

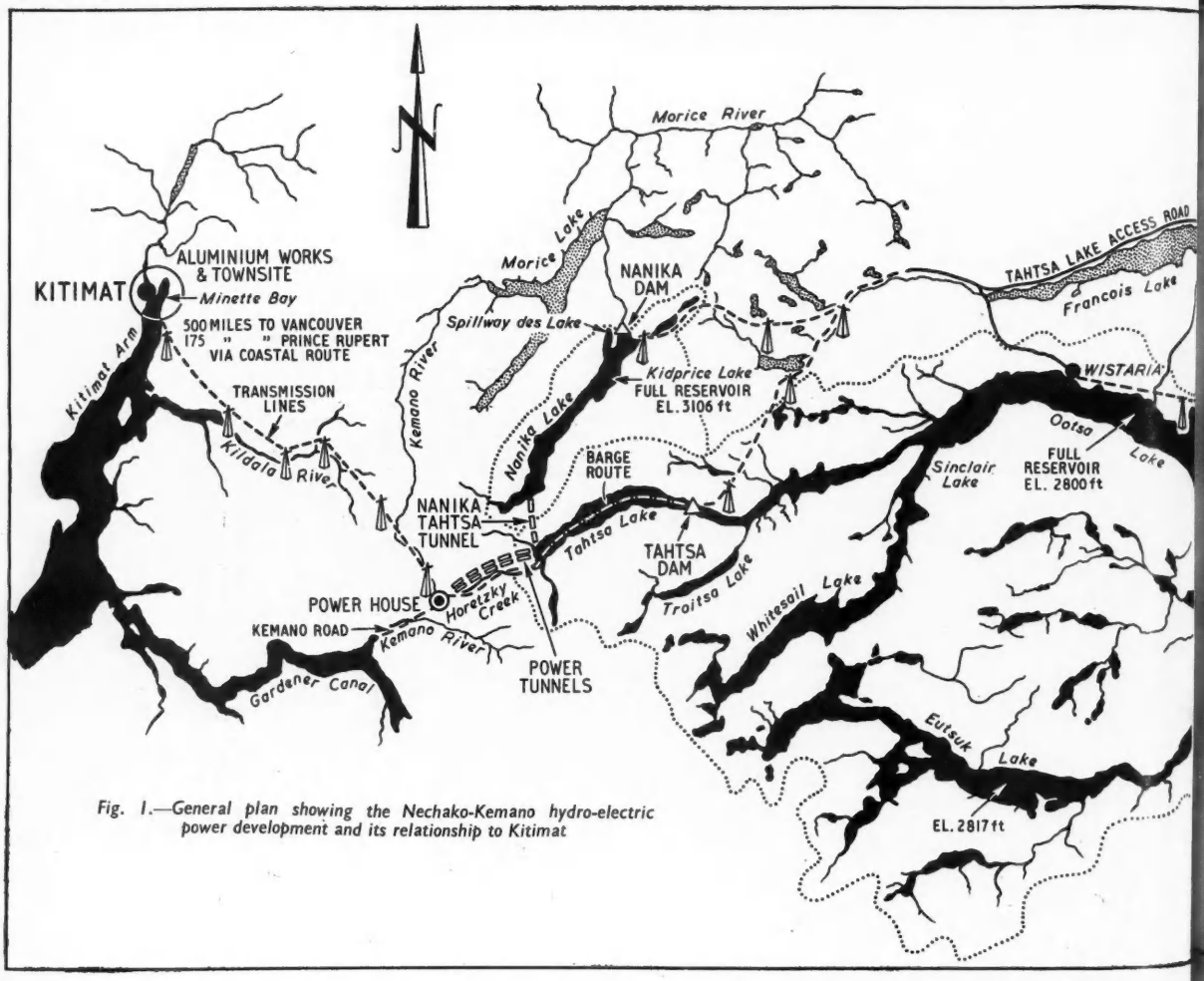


Fig. 1.—General plan showing the Nechako-Kemano hydro-electric power development and its relationship to Kitimat

oil-filled cables per circuit, with a current-carrying capacity of at least 550 A. These cable circuits are about 2,000ft long with a maximum difference in elevation of 75ft. Two manufacturers are each supplying a cable circuit for the initial stage of construction. These cables, with their joints and terminals, are designed to meet the same impulse specification as the transformers, namely 1,050 kV with a 1·5/40 μsec impulse.

The cables are to be installed in a special cable tunnel, divided into two sections by a vertical wall. Two cable circuits, carrying the output of four generating units, will be carried in each section on insulated supports, with 5ft vertical distance between circuits and 1ft horizontal spacing between cables of the same circuit. The sheaths will be earthed at the mid-point only, to eliminate sheath loss.

Auxiliary Supplies

At Kemano, economic design dictates the use of cooling water pumped from the tailraces. Hence the auxiliary power supply at 550 V must possess a high degree of reliability. To meet this in the initial stage of development, two three-phase 2·5 MVA water-cooled transformers are being installed, either of which can carry the load alone. The No. 1 auxiliary transformer, as shown by Fig. 3, can be supplied from generators Nos. 2 or 3 directly, or from generator No. 1 through the transformer bank. No. 2 auxiliary transformer can be fed from generator No. 2 directly, or from generators Nos. 1 or 3 through the transformer bank. The various motor-operated switches or isolators for the several sources are so interlocked that generators or step-up transformer banks cannot be paralleled through them.

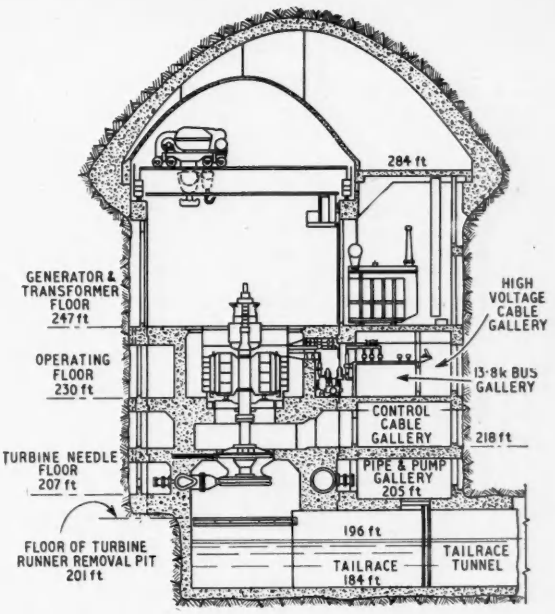
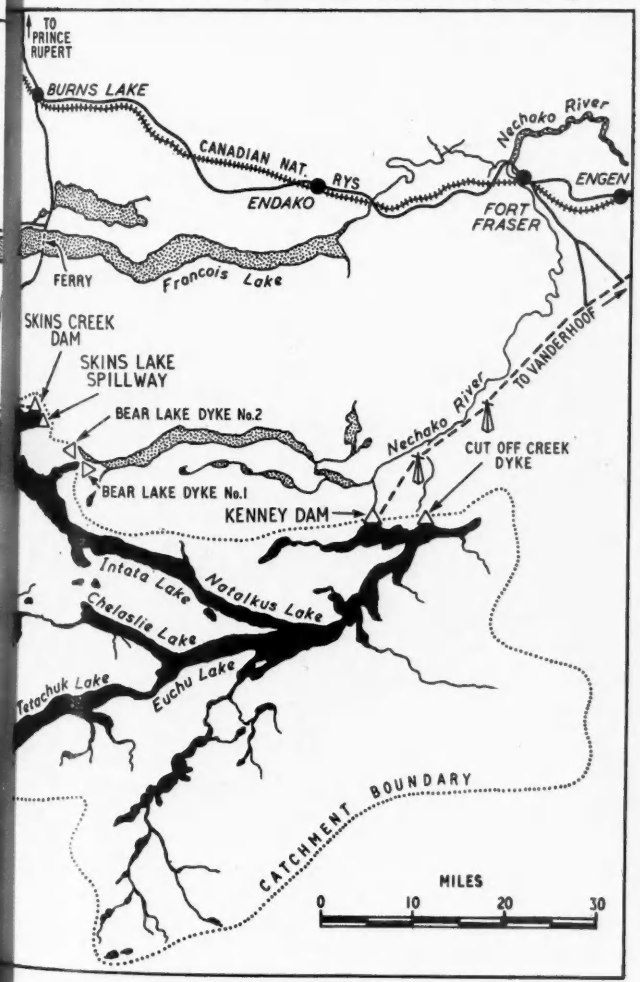


Fig. 2.—Cross-section of Kemano power station showing disposition of plant and elevations above sea level



Careful attention has been given to the auxiliaries of equipment, such as the transformers and 300 kV circuit breakers, which serve two generating units. Each of the two coolers on a step-up transformer bank is supplied with cooling water from a separate header. Likewise, the two oil pumps are fed from different field cubicles.

Generator stator-winding protection consists of a differential scheme and a split-phase scheme. The differential scheme comprises percentage-type instantaneous balanced-beam relays with restraining and operating windings energized from 6,000/5 A current transformers on the neutral leads and two 3,000/215 A current transformers on the two phase leads. The split-phase scheme involves a double-primary 500/500/5 A current transformer located between the generator circuit breaker and its switch so that it overlaps the transformer differential zone. A primary unbalance of 50 A or 1 per cent should operate the high-speed induction-type relays with a time delay of about three cycles. An instantaneous balanced-beam over-current relay in the neutral of the stand-by current transformers or supplied from a current transformer in the secondary of the earthing transformer will provide fast sensitive protection against faults to earth on the busbar, the l.v. winding of the step-up transformer

or the h.v. winding of the station service transformer. The stand-by protection is furnished by voltage-restraint over-current relays.

The protection operates one of two relays, which trip the generator, field and exciter-field circuit breakers and the governor shut-down solenoid. At 15 per cent normal speed the generator brakes are applied automatically. A field-failure relay, actuated from the field shunt and set for 85 per cent of field current at normal no-load voltage, trips the generator circuit breaker only. The field earth detector, which is an over-current relay in a source applying 110 V at 60 c/s between the field circuit and earth, actuates an annunciator signal. This affords protection on the entire generator d.c. and main exciter armature circuits.

Both a.c. and d.c. over-voltage protection is provided. The former operates a contactor, inserting resistance into the main exciter field, as well as actuating the motor-operated rheostat in the " lower voltage " direction. This overrides the voltage regulator, so that loss of potential on the regulator cannot result in over-excitation. The d.c. over-voltage protection inserts resistance into the pilot-exciter field.

The generator thrust bearing is protected by two temperature relays; one annunciates only while the other, at a higher temperature, actuates the trip relay and, at 50 per cent speed, applies the brakes continuously. This arises from the high speed and large inertia of some 25×10^6 lb-ft^2, since the generator must be brought to rest as quickly as possible in the event of a thrust-bearing failure to minimize damage. Reduction of governor oil pressure results in a signal and then in the operation of a trip relay before the pressure drops too low to actuate the turbine-nozzle needles.

The transformer-bank differential protection utilizes current transformers on the l.v. side with a ratio matching that of the main bank, with both h.v. and l.v. current transformers having a saturation characteristic such that the knee of the curve is at 230 V, with a magnetizing current of 0·1 A. The relays are of the differentially-connected low-energy induction type with instantaneous trip attachments. An earth relay is energized from a current transformer in the transformer-bank neutral connection.

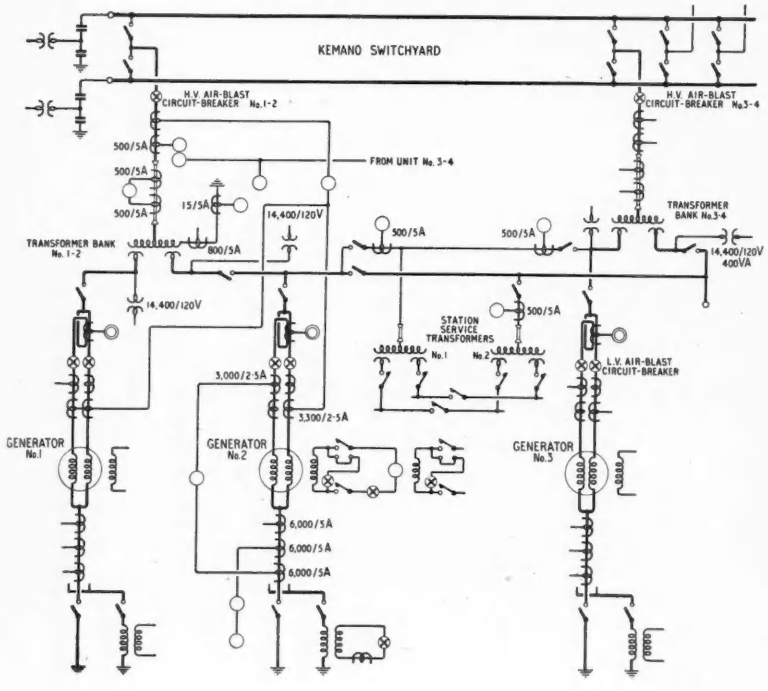
A differential scheme also protects the 300 kV power cables by means of through-type current transformers around the cable immediately below each termination, using high-speed induction relays. The transmission-system relay protection, in the initial stage, comprises phase and earth induction over-current relays, with a total earth-current relay. However, provision has been made for the installation of phase-comparison-type relays if found desirable.

For each generator, the three-phase currents, the real and reactive power, turbine-needle opening and needle limit, the field current, the pilot-exciter voltage and the frequency require measurement. The current in the h.v. winding of each transformer is indicated to show the total load on the transformer bank and the 300 kV cables. The generator output is summated, indicated and recorded. High-speed multi-point instruments will record the temperature indicated by two embedded thermocouples in each generator stator winding, and the winding temperature for each transformer will be recorded on similar instruments.

Control Arrangements

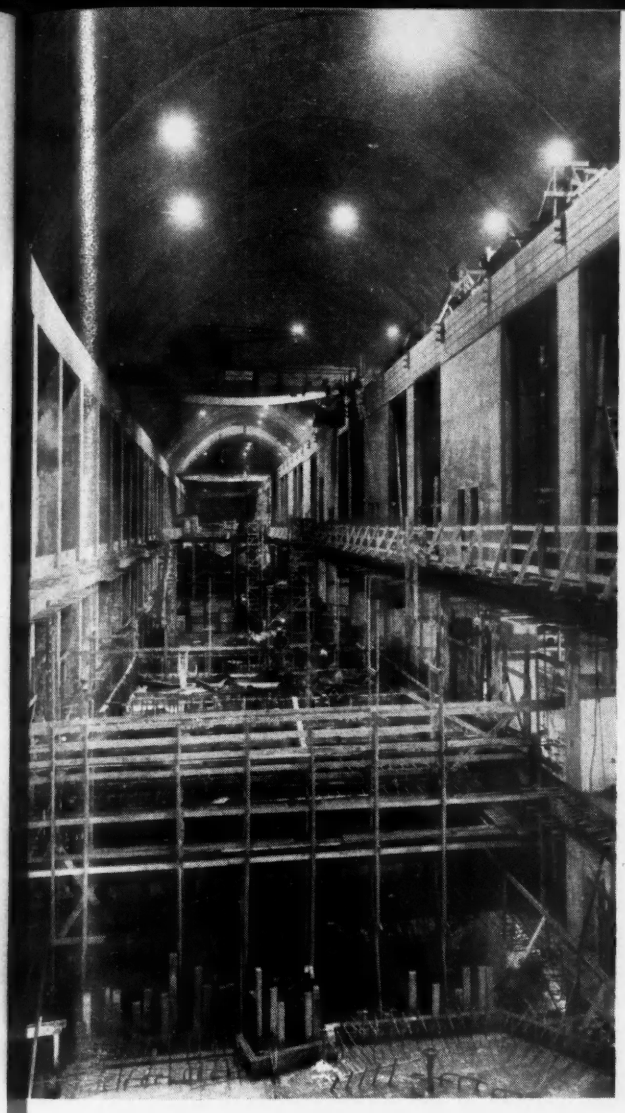
The control room occupies space in the service area similar to that occupied by the transformers in the remainder of the station, i.e., the width is fixed by the length of the transformer vaults and the length by that of the service bay. The basic problem was to arrange control panels, relays and instruments for the ultimate 16 generating units in the fixed control-room area so that the operator could see and reach all necessary points. Moreover, the layout had to be adaptable for various numbers of generating units from four upwards to 16, since there may be a substantial time lapse between completion of the various stages. As laid out, the maximum distance between the operator's desk and any instrument is 21ft.

Fig. 3.—Kemano initial one-line diagram



One control feature is worth noting. Aluminium - reduction cell lines or series, commonly termed " pot-rooms " in North America, are normally supplied by mercury-arc rectifiers. These are quite sensitive to voltage variations but insensitive to frequency fluctuations. It is planned to telemeter the voltage on the Kitimat high-voltage busbar to the control room in the generating station. During initial stages of development the control-room operator will be able to maintain the Kitimat voltage at a desired level. Before load pick-up the voltage can be raised by an amount equal to the expected drop on load application.

The h.v. circuit breakers are of the air-blast type, with an interrupting capacity of 6,000 MVA on a symmetrical basis at 301 kV, with a rate of rise of recovery voltage of 1,850 V/μsec. Calculations show that even with all transmission lines disconnected from the busbar, in the ultimate development the rate of rise of recovery voltage will



Above: General view inside the power house at Kemano, looking south, showing framework and reinforcing steel at Unit No. 2.

Right: Manifold for Unit No. 1 turbine at Kemano, viewed from the north wall of the power house

be about 1,200 V/μsec. With this rate of rise the interrupting capacity is 7,000 MVA symmetrical at 301 kV. The calculated duty is 6,000 MVA for a line-to-earth fault between the circuit breaker and the h.v. cable termination. The circuit breakers are built for a current carrying capacity of 800 A and an impulse level of 1,050 kV. The opening time is five cycles and the closing time six cycles. Opening or closing draws 3 A from the storage battery.

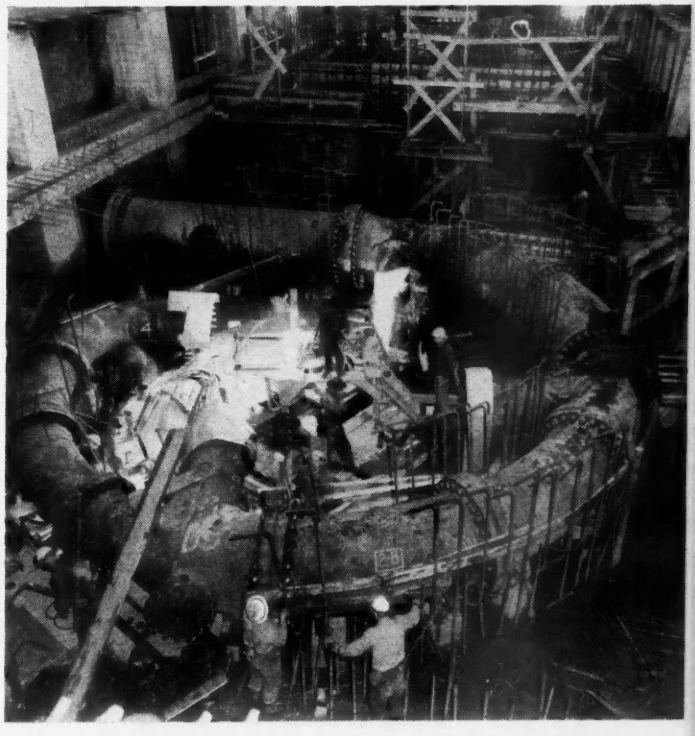
The unit h.v. isolating switches are quite standard, in contrast to the line isolators. The latter have a current rating of 1·6 kA and are equipped with interruptors in parallel with the main blade to give an interrupting capacity of 90 A when breaking line-charging current at 300 kV, or a load current of 800 A with 60 kV across the isolator, several times before serious contact erosion develops. It is expected that it will be possible to switch the transmission lines without circuit breakers. Should this prove feasible, and if transmission-line faults are as low as anticipated with the line design and foreseen isoceraunic level, line circuit breakers will not be installed, although provision is made for them.

From the power plant the first ten miles of the transmission system will comprise two double-circuit tower lines, gradually climbing to about 1,000ft in altitude, at which point they feed into a switching station with motor-operated selector/isolator switches. The outgoing lines will consist of two single-circuit tower lines, which traverse a pass with a maximum altitude of about 5,300ft for a distance of 10·6 miles. They then descend to another switching station, at a height of 500ft, from which two double-circuit tower lines will run the remaining distance to the terminal station at the Kitimat aluminium-reduction plant. In this stretch of the line about three miles will run between 2,000 and 3,000ft above sea level.

Designing for the transmission of 1,670,000 h.p. firm delivery at Kitimat through relatively narrow valleys, having regard to potential snow and rockslides at some points, and across a narrow mountain pass with a maximum altitude of some 5,300ft, is a difficult problem. The snow may lie 20ft or more deep during the winter months, and icing conditions may be very severe, with a short construction season. Moreover, the transmission lines must provide absolutely reliable service, because the aluminium-reduction process is a continuous one.

For the double-circuit tower lines, standard s.c.a. 54/19 (Falcon) cable of 1,590,000 circular mils cross-section, with an outside diameter of 1·545in and a weight of 2·032 lb/ft is being used; the ultimate strength of this conductor is 55,400 lb. The double earth wire at the terminals will be $\frac{3}{8}$in diameter high-strength steel cable, with an ultimate strength of 50,000 lb. Insulation will comprise sixteen 10in × 5$\frac{3}{4}$in 25,000 lb (mechanical and electrical) standard suspension units in suspension strings and eighteen in strain strings. Single strings will be used for suspension points, with double strings for long spans. At strain points, triple strings will be used.

For the single-circuit tower lines through Kildala Pass the conductor will be s.c.a. cable, with an outside diameter of 2·295in, a weight of 4·77 lb/ft and an ultimate strength of 135,700 lb, the cross-sectional area being 3,364,000 circular mils. The insulators will be similar to those used

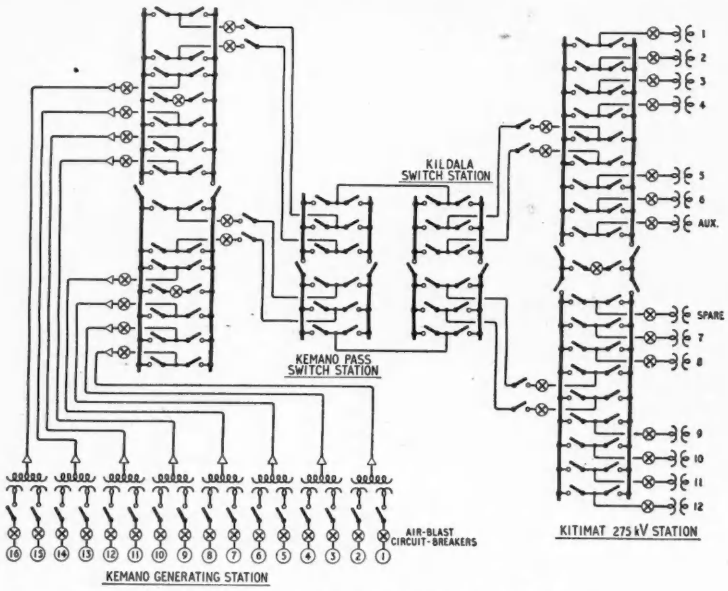


on the double-circuit tower lines, except that there will be eighteen units in suspension and twenty in strain strings. Triple or quadruple strings will be used for suspension, according to requirements, and sextuple strings for strain application. A maximum insulator swing of 36 deg from the vertical is allowed.

One of the two single-circuit transmission lines across Kildala Pass will be built with steel towers of generally conventional design. The suspension and light-angle towers will weigh about 33 tons each; the heavy-angle and the strain types will be substantially heavier, depending on height. The other single-circuit transmission line across Kildala Pass will be built with aluminium towers, using a design of which a prototype has been successfully built and thoroughly tested. This design is a braced H-frame type of tower which is composed of five thin-walled aluminium tubes and a box-girder cross-arm. These towers will weigh substantially less than the corresponding steel towers and are expected to show considerable economies in transportation, erection and maintenance.

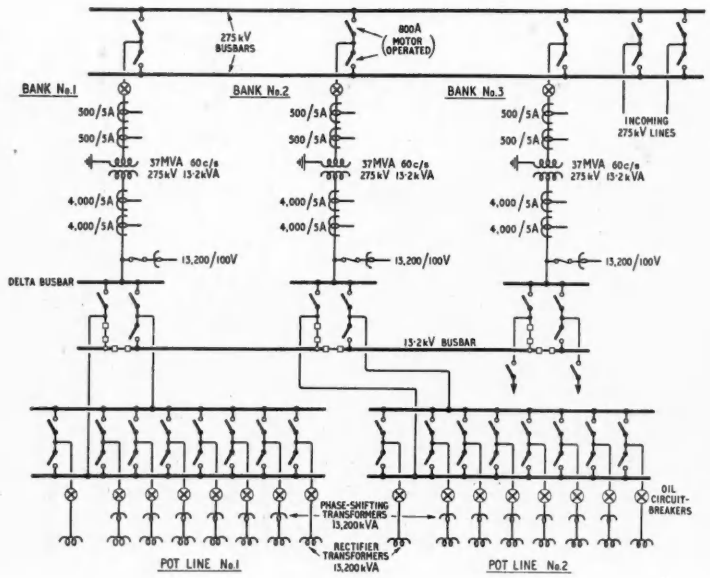
Normal operation of the transmission system when fully loaded in the ultimate development will utilize only half the inherent capacity. With two circuits between Kitimat and the switching station on the Kildala side of the Kildala Pass out of service, the limit of power which can be transmitted is about 1,600 MW, so that the firm load of 1,200 MW can be handled with a margin of 25 per cent.

In the initial stage the power-supply facilities at the Kitimat reduction plant will be as shown in Fig. 5 although ultimately they will be as shown in Fig. 4. The step-down transformer banks are single-phase forced-oil water-cooled units rated at 37 MVA, with a voltage ratio of 275/13·2 kV, having four 2·5 per cent taps, the neutral being solidly earthed. Each bank of the initial three is being supplied by a different manufacturer.



Above: Fig. 4.—The probable ultimate system diagram.

Below: Fig. 5.—Kitimat initial one-line diagram



Each potline will be supplied by eight mercury-arc rectifier equipments of the ignitron type in the initial establishment, each rated at 12·5 MW. These equipments comprise a single-tank 1·2 kA 1,000 MVA interrupting capacity outdoor oil circuit breaker and a self-cooled phase-shifting transformer rated at 13·2 MVA, with a three-phase primary and two six-circuit star-connected secondary windings. These windings supply the 24 anodes of two rectifier frames, each consisting of 12 pumped ignitron-type water-cooled rectifiers with auxiliary equipment. The cathodes of the 16 frames are connected through high-speed air circuit breakers to the positive main d.c. busbars. The neutral points of all secondary windings are connected to the negative d.c. busbars through inter-phase transformers. The rectifier equipment will have an efficiency in excess of 96 per cent from the 13·2 kV a.c. busbar to the 1,000 V d.c. busbar.

The h.v. circuit breakers and isolating switches are similar to those used at Kemano. Outdoor l.v. isolators are rated at 6 kA for main connections and 1·2 kA in rectifier connections.

Transformer Protection

The step-down transformer banks are protected on the primary and secondary sides by induction-type phase and neutral over-current relays. Individual transformers are equipped with gas-detector relays similar to those used at Kemano. Alarm devices are employed for the oil and water lines and for the winding-temperature detectors. The rectifier transformers are protected by primary-phase and neutral relays, gas-detector relays, and high-temperature and low-oil-level alarms. The rectifier units are

equipped with loss-of-vacuum, reverse-current and over-temperature protection.

A master earth relay scheme discriminates between a fault on the transformer-bank side of the h.v. circuit breaker, for which it is inoperative, and on the busbar side, for which it operates. On operating, this relay scheme remotely trips the h.v. circuit breakers at Kemano by means of two tone-generators in series and two in parallel on different carrier channels, thus ensuring rapid clearance of a line fault near Kitimat or one on the busbar.

United Kingdom's Share

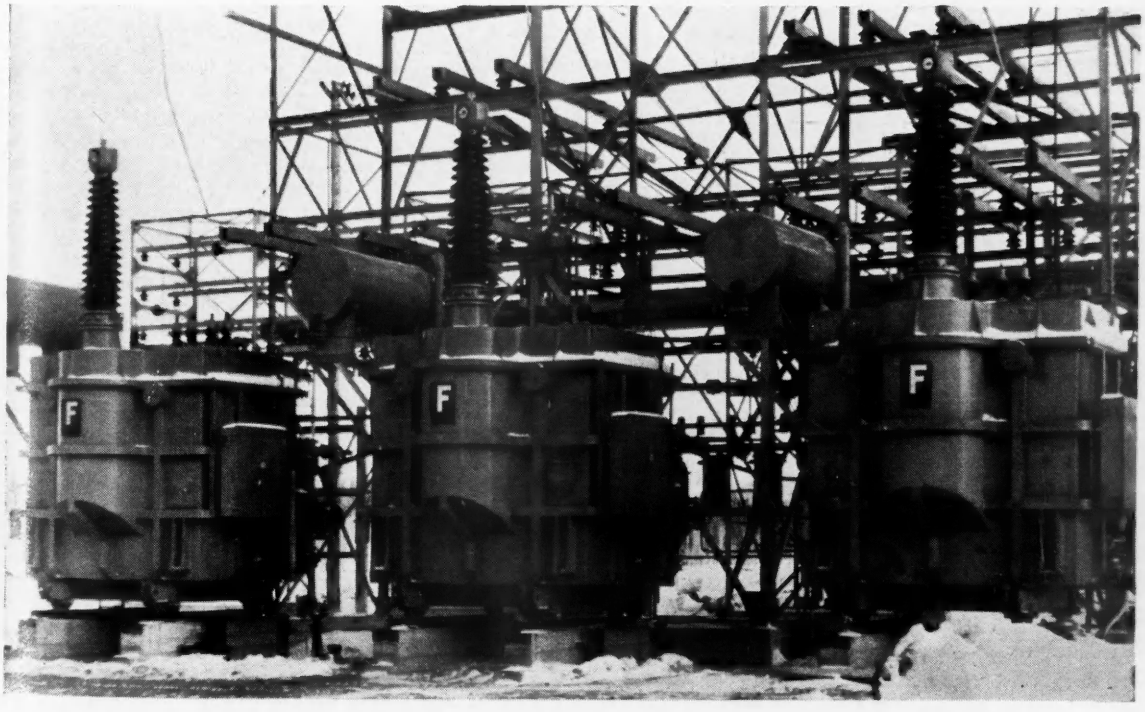
Reference has been made to various items of major equipment being secured from different manufacturers in each of several categories. Those engaged in the design and manufacture of heavy equipment will be interested to learn that half of the initial 300 kV power-cable order, one of the initial step-up transformer banks, one of the generators and part of the pressure-conduit liner steel for Kemano are being secured from United Kingdom sources. Moreover, half of the potroom cranes, the unloading equipment, a number of other cranes and considerable miscellaneous equipment for the Kitimat aluminium-reduction works are being purchased in Great Britain. The company is buying as much as possible in the United Kingdom, in view of this country's purchases of aluminium and other Canadian products.

The Kemano hydro-electric development and the Kitimat aluminium-reduction works are being built by the Aluminum Company of Canada, Ltd., the Canadian production unit of Aluminium, Ltd.

This article is based on a Supply Section paper which was presented at an ordinary meeting of the Institution of Electrical Engineers in London last night by Mr. F. L. Lawton, of Aluminium Laboratories, Ltd., the research, engineering and geological exploration unit of Aluminium, Ltd.

One of the transmission line towers during stringing operations looking down the Upper Kemano Valley

Bank of three 275/13·2 kV single-phase forced-oil water-cooled power transformers in substation No. 3 at the Kitimat aluminium-reduction plant



VIEWS on the NEWS

By REFLECTOR

ONE might have expected the stand of the British Electrical and Allied Manufacturers' Association at the Electrical Engineers' Exhibition to be extremely practical and austere. I am glad to report that it was not; its principal feature was a most tasteful and beautiful array of flowers. There was a small practical touch in a number of pairs of illustrations showing ancient and modern electrical equipment and methods. Electricity in bathrooms was not regarded with such horror in Victorian times as it quite justifiably is now. One of the illustrations depicted a gentleman in his bath provided with direct connections to some electro-medical equipment, the inscription reading:—"Electric bath installation with all necessary appliances for constant and Faradic current application."

* * *

Many ingenious devices are resorted to by people who wish to obtain their electricity for nothing—and many think that they should. The latest is reported from Salford and in this case a good Samaritan apparently thought he was entitled to payment for his services. A neighbour asked him to install a point in her kitchen and this necessitated his operating on some wiring in the cellar. Some time later the neighbour noticed an extra pair of wires running from her meter through a hole in the cellar wall. When prosecuted for diverting electricity (for which he was fined £25) the defendant admitted that for three months or so he had been running a radio set, an iron and four lights at his neighbour's expense. His own supply had been cut off previously because he had failed to pay the bill. This case should prove a further warning to people not to employ "amateur" electricians; they may be expensive as well as dangerous.

* * *

Among its satisfied consumers the Southern Electricity Board numbers the Poet Laureate. At least I gather so from a report that Dr. Masefield recently presented each of the assistants at the Board's Abingdon showrooms with a volume of poems accompanied by a graceful little note. No doubt Dr. Masefield regards electricity as an everlasting mercy.

* * *

Attention is given in "B.I.P.," the quarterly magazine of Electricité de France, to a sales promotion conference held by the Eastern Electricity Board last May. The report, by M. Jacques de Felice, director of "Unimarel," an organization for the study of electricity sales, is prefaced with a note that, for various reasons, the methods described are not applicable in French conditions. With this qualification the article presents a number of factors which are of a basic character. Not the least interesting feature of the article is the gallicization of phrases familiar in this country. For instance, "Fair Trading Policy" becomes "*les règles de la loyauté commerciale*"; the Minister of Fuel and Power is "le Ministre des Combustibles et de l'Energie." Monsieur de Felice confesses at the end of his report that the methods and commercial organization of the English electricity distributors give food for thought and, he says, one can understand why in this country of coal and gas the average consumption of the English domestic consumer is five times that of his French counterpart.

Illustrations in the same issue of the magazine include views of the London Electricity Board's Mitcham and Fulham service centres and an electrified farm in Surrey.

* * *

This week I quote the following amusing passage from the *Electrical Review* of 23rd March, 1894:—

> "There is a diminutive central electric lighting station in Sydney which is, perhaps, deserving of notice. The enterprising proprietor of a ham and beef shop, who also manufactures sausages by means of a machine driven by a gas engine, being no doubt dissatisfied with the load factor of the plant, conceived the brilliant idea of utilising his gas engine to manufacture sausages during the day and electricity by night. The project having been carried into effect, it naturally followed that as the sausages were manufactured for export, the electricity was also used as a marketable commodity, and is now being sold to sundry neighbours for the purpose of illuminating their shops. Eight of the neighbours have seized the opportunity, and dispense their goods under the light shed from incandescent lamps, a ninth neighbour, a draper, being content with an arc lamp hung over the footpath to attract the passer-by to examine his wares."

Perhaps the B.E.A. might consider the manufacture of sausages by night as a means of improving its load factor. The terms of the Electricity Act of 1947 are probably broad enough to allow it.

* * *

Maybe it is true that people are known by the company they keep but I hope that this dictum does not extend to trade and technical journals. The scene of the action in a play put on last week by a well-known electrical concern's amateur players was a not-so-reputable café "off the Edgware Road." Prominent among the reading matter provided for its clients were copies of the electrical weeklies. I can only conclude that they were there to add to the "electric" atmosphere of the play in which robbery and murder were principal ingredients.

* * *

About 80 council tenants in Scone (says the *People's Journal*, Dundee) are to get electric light at the expense of the County Council. It appears that the houses concerned are pre-1914-war buildings and complaints have been made about the gas system. The Gas Board made a thorough inspection of the houses and reported unfavourably on certain aspects of the gas system. As a result the Council is to spend over £2,000 in installing electric lighting, although, the report ends, "gas will still be used for cooking." I regard this as a lost opportunity.

* * *

I recently mentioned the village in Scotland where, when the church heating was switched on, the inhabitants were unable to do their cooking. I have just received a cutting in which this story is repeated. The journal from which it comes is called *Joyous News*.

ELECTRICAL WHOLESALERS' DINNER

President Condemns Price-Cutting

Mr. W. J. Brown with the President (Mr. E. A. V. Peckham) on his left

As is usual, the Electrical Wholesalers' Federation had many well-known representatives of all branches of the electrical industry at its annual dinner, held on Thursday last week at the Dorchester Hotel, London, W.1.

The company numbered over 500. The president, Mr. E. A. V. Peckham, was in the chair and Mr. W. S. Brown, former Independent M.P. for Rugby, was the principal guest. In proposing the health of the Federation Mr. Brown, as a trade unionist, greeted the members of another trade union. He said that the wholesalers existed for the good reason that they wanted to make a profit. Of course if they made a profit they were called profiteers; if they did not it was held to prove the inefficiency of private enterprise. Anyhow somebody had to make a profit to balance the losses of the nationalized industries.

In the course of his response to the toast Mr. Peckham said he intended to take the opportunity afforded by the presence of so many representatives from all sections to draw attention to the prevalence of price-cutting. It was becoming more and more difficult for the honourable trader in any of the sections to hold his business without departing from the principles laid down in the Electrical Fair Trading Policy.

There were many causes of price-cutting and the Federation had put forward constructive proposals to remove some of them. They held that the granting of quantity buying terms must have an inflexible basis of operation and must be freely published to all entitled to take advantage of them, including the wholesalers through whom most of the goods would flow.

Another major cause of price-cutting, one that only the manufacturers could handle, was over-production of certain commodities (mainly lighting accessories). This had led some manufacturers into the fallacious conception that the more wholesale distributors there were the greater would be their sales, whereas experience had proved the contrary.

That led the speaker to insist again that distribution through wholesalers was the most economical and efficient means of moving goods from manufacturers to retailers and contractors. But the system could only be really efficient if a reasonable amount of business was available to each wholesaler. Some manufacturers were competing with them through branches but he felt that if all manufacturers' branches had to show a profit or close down many more manufacturers would follow the lead of one of the largest of them who had announced the previous week that they were closing three of their provincial branches.

While the E.W.F. did not advocate a " closed shop " it considered that it would be prudent for manufacturers and their associations to curb the granting of discounts to anybody who thought he would set up as an electrical wholesaler.

He felt that all those concerned should start an immediate crusade to bring home to each other the fact that the maintenance of recognized practices—even the honouring of agreements—was not only right and proper but was common sense and eventually " paid dividends."

Mr. W. Crisp, who is succeeding Mr. Peckham as president, proposed the toast of the guests, making special reference to the presence of Monsieur A. Arnould, a manufacturer and wholesaler and member of the French counterpart of the E.W.F.

A reply was made by Mr. A. F. Plummer, vice-president of the Electrical Contractors' Association, in a very witty and amusing speech.

Entertainment was provided by Arthur Salisbury and his orchestra, Joan Turner and David Nixon.

The President with (left to right) Mr. J. Eccles (B.E.A.), Col. B. H. Leeson (B.E.A.M.A.), Mr. C. J. W. Scott (E.L.M.A.), Sir John Hacking (Merz & McLellan), Messrs. T. W. Heather (E.F.T.C.), C. A. Hughes (E.L.F.A.) and C. O. O. Herzog (R.W.F.)

Engineering in Europe

Abstracts from Technical Journals

POWER-PHASE REGULATION uses the two following basic principles: (1) To let the output of every regulating machine vary in accordance with a single reference parameter, itself tending towards a constant value when the frequency tends towards its rated value. The reference parameter to be chosen is the phase difference between system voltage and the voltage of a source of a standard frequency. Every value of the parameter (" phase of the system ") corresponds to a definite value of the load of every regulating machine. Therefore the distribution of the regulating power on the machines taking part in the regulation will correspond to the predetermined relationships. (2) To decentralize the regulation by augmenting the number of regulators bringing the output of the regulating machines under the control of the phase of the system; this implies either the distribution of the standard frequency to all the regulators, or the local production of the standard frequency by special, very precise and stable, generators.

The authors report on large-scale experimental work on this type of automatic frequency regulation in single and interconnected power systems (extending in some cases even beyond the French borders) with very satisfactory results. All the essential details of the regulating circuits and apparatus and of their mode of operation are given and the experimental results are illustrated by a great number of regulating curves obtained at various points of the tested systems.—" Power-Phase Regulation. New Method of Automatic Frequency Regulation of a Power System supplied by Several Generating Stations," F. Cahen and A. Chevallier, *Bull. Soc. Franc. Elect.*, 7th series, Vol. 3, No. 34, pp. 614–637, 1953, in French.

Measuring Post-Arc Currents

The measurement of the post-arc currents is one of the most important means of investigating the phenomena accompanying the arc-quenching process and actually conveys the clearest idea of the mode of operation of the breaker. The value of the residual current together with the restriking voltage enable the variation of the conductivity of the ionized break after arc-extinction to be directly calculated, this showing the efficacy or otherwise of the de-ionizing agents and the time relation of the de-ionization.

Obviously it is also a reliable means of determining the limit of the breaking capacity of the breaker by test series with increasing powers, of co-ordinating synthetic testing methods and certain breaker types, etc.; this is documented by the discussed case of a magnetic circuit breaker where the post-arc currents reach values excluding the use of any synthetic testing method in which the high voltage is supplied by a generator of small output. The oscillograms presented were taken by loop oscillograph as well as by two special cathode-ray tubes, one with electric and one with magnetic beam deflection, and photographed on a rotating film.

From the residual-current and restriking voltage oscillograms, obtained for the first time on a magnetic circuit breaker, the variation of the resistance of the residual arc column was calculated. It was found that within the range of currents considered the values of the resistance were higher than the critical ones.—" Measurement of the Residual Current in a Magnetic Circuit Breaker after Clearing a Short-Circuit," V. Zajic and V. Taimr, *Elektrotech. Obz.*, Vol. 42, No. 7–8, pp. 375–381, 1953, in Czech.

Power Station Switching

New principles in designing the switching connections of a power station apply to stations whose output is essentially at the generated voltage, particularly the type of an output of about 25 MW, generator voltage 6 kV. However, the same principles may be applied to larger as well as to smaller outputs and/or voltages.

These principles consist mainly in the use of combined distribution equipment with a single busbar system supplied through group reactors, for the feeders. This reduces the possible short-circuit currents to values compatible with the design of the switchgear and the switching connections. The number of circuit breakers is greatly reduced by the use of group reactors and the simplification of the connections between generators and transformers.

The system enables individual circuit breakers and whole group assemblies to be inspected and, if necessary, repaired, without interruption of the supply of any consumer. The structural design of the switch galleries and the bus structures are simplified by the use of prefabricated concrete assemblies. The saving in erection time is estimated as 66–75 per cent, the size of the station (or substation) buildings being also reduced by 30–50 per cent, and the cost of the electrical equipment by 20–30 per cent. It is also claimed that the continuity and reliability of the supply is considerably improved.—" Novel Layout and Design of the Switching Connections of a Power Station," L. I. Dvoskin, *Elektrichestvo*, No. 11, pp. 16–24, 1953, in Russian.

Dielectric Testing of Insulators

The author considers the well-known methods of laboratory tests on insulators, stressing the necessity of periodical controls of specimens taken from insulator strings of lines in service which, obviously, furnish only an indirect and problematical indication of the condition of the other insulators of the same strings. On the other hand, the laboratory tests give accurate values, whereas most of the existing live-line testing apparatus, such as the Koske or Siemens tester, while enabling whole strings to be tested through, are of a primitive kind and measure the voltages across the insulators in a rather rough-and-ready way. Electrostatic voltmeters used in the United Kingdom and the Doble method used in the United States provide an indication of whether the insulator is punctured or not, without short-circuiting it. There are also voltmeter methods for determining the potential distribution along an insulator string from which faulty insulators may be diagnosed.

Advantages and disadvantages of these methods are discussed in great detail, the conclusion drawn being that all of them are only compromises and none, by itself, is fully satisfactory. And yet, failing a complete solution of this important problem, a suitable combination of two or more of the methods may give a reasonable amount of certainty about the condition of the line insulation.—" Testing of the Dielectric Condition of the Insulators on H.V. Transmission Lines," B. Gaillet, *Bull. Soc. Franc. Elect.*, Vol. 3, pp. 562–569, 1953, in French.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.

OIL REFINING CONTROL

New Electronic System and Equipment

We recently saw at the Chiswick, London, works of Evershed & Vignoles, Ltd., a control desk and allied equipment which are components of an electronic system of control for a crude-oil distillation plant being supplied by the company to the instructions of E. B. Badger & Sons, Ltd. It is to be installed by the Bechtel-Wimpey Organization for the Anglo-Iranian Oil Co. The instrumentation is unconventional in that it is electrically operated. Each 60,000 B.P.S.D. (" barrels per stream day ") unit is automatically controlled from a desk designed to fit into a bay window overlooking the plant. The process is illustrated by a coloured mimic flow diagram with indicators and controller adjustments mounted at appropriate points.

The electronic controllers are arranged as plug-in units and are nested in cubicles in the wings of the desk for ease of servicing. Miniature recorders are provided for temperature, flow, pressure, etc. In addition to being recorded, the quantities of the various products are summated by electrical integrators mounted in the side wings. Signals from the measuring elements of the plant are transmitted by multi-core cables to the control room where the controllers are connected by further cables to electro-pneumatically operated valves on the plant. Some forty controllers are used to control each unit, including those for flow, pressure, level and temperature. Transmitters are also provided to indicate in the control room the specific gravity of various products. Excessive deviation from measured values, in five cases, actuates audible warnings. Each desk is arranged for shipment in five sections and quick release terminals are provided to reduce assembly time on site and to facilitate maintenance.

In this control system a current transmitting scheme is used and the operation of the controller is based on a modified application of the same scheme. In the transmitter the torque exerted by the originating movement is balanced by the torque of a coil operating in the cathode circuit of a thermionic tube. The balancing coil is connected in series with simple milliammeter movements in indicators, recorders and controllers, which therefore receive signals proportional to the measured quantity. Any unbalance created by a change in the quantity being measured causes the grid contact to touch the positive or negative bias contact, thereby raising or lowering the plate current until the system is again in balance. The transmitter compensates automatically for any change in supply voltage, circuit resistance or frequency.

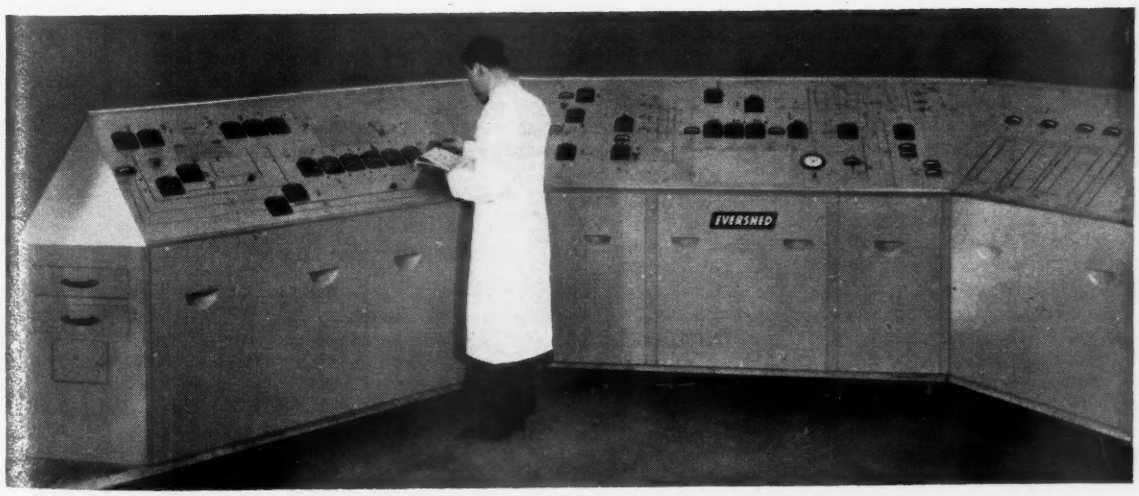
For the measurement of level under pressure, a displacer type level detecting element is used. The displacer is connected to a pivoted lever which operates through a bellows seal and winds up a small spring whose torque is therefore proportional to the level.

A level displacer is also used for the measurement of specific gravity in ranges down to 0·25. In this application the displacer is fitted with a bellows at the lower end which is filled with liquid having the same temperature coefficient as the liquid being measured. The readings are thus compensated for any temperature variation.

A flow transmitter has a manometer fabricated from stainless steel tube to form the measuring and range tubes. A cylindrical magnet, polarized along its axis, floats on mercury in the measuring limb of the manometer and exerts a repelling force on a pivoted strip magnet which is mounted externally and carries a balancing coil. With zero differential, the repelling force acts through the fulcrum of the pivoted magnet so that no turning moment exists, and the balancing current is zero. With a change in mercury level, the cylindrical magnet rolls away from the fulcrum, producing a turning moment and deflecting the balancing coil. In deflecting, the appropriate bias contact is made and the plate current varied, until the torque exerted by the coil balances that due to magnetic repulsion. The current in the coil and instruments connected in series is, therefore, proportional to the differential head.

For measurement of the small potentials generated by

The control equipment for the electronic system forms a desk designed to fit into a bay window overlooking the plant



thermocouples, a modified form of the transmitting system is used. In this case, however, the transmitter operates as an e.m.f. balancing device and is essentially a resistive feedback amplifier. The thermocouple e.m.f. is balanced by a feedback voltage derived from resistor No. 3 in the cathode circuit of a thermionic tube. The plate current, 0 to 30 mA, is therefore proportional to the thermocouple e.m.f. and may be used to operate indicators, recorders and controllers. Any unbalance is detected by a robust moving coil galvanometer carrying a shutter which controls the amount of light falling on two photo-electric cells connected in a bridge circuit. The bridge voltage is applied between the grid and cathode of a thermionic tube, thus varying the current to bring the system again into balance. An output of 30 mA is obtained for an input of 10 mV and by reason of the resistive feedback and consequent high input impedance the thermocouple circuit resistance is not critical.

A temperature sensitive bridge (No. 5) is used to provide cold junction compensation. A resistance thermometer element situated near the galvanometer coil forms one arm of the bridge. A proportion of the bridge output is in series with the thermocouple, providing a compensating voltage for changes in ambient temperature. For suppressed ranges, the values of the fixed arms of the bridge are chosen to provide a backing-off voltage.

Controllers

The transmitter torque balancing coil forms part of the measuring unit and provides a current of 0 to 30 mA proportional to the measured quantity. The proportional and integral units are current balances and operate in a similar manner to the transmitters. The voltage applied to the grid of the appropriate tube, however, is modified by unbalancing the light distribution on two photo-cells forming part of a bridge.

The desired value is established by a current derived from a neon stabilized supply, the value being controlled by a variable resistor. This current (I_c) provides the reference with which the measuring current (I_m) is compared. The two currents are compared by feeding them in opposition through one winding of a double coil movement. A change in the measuring current deflects the movement and unbalances the photo-cell bridge connected to the grid of a tube. This plate current passes through a second winding of the movement and the coil of the valve positioner. The current required to re-balance the bridge is the difference between the desired value and measuring current and represents the error in the system.

A further current, derived from a rectifier, is fed in opposition through the same circuit, producing a centre zero current in the second winding of the movement, and an error current which can change in magnitude and direction. The sensitivity of valve response or proportional band is varied by a differential shunting resistance between the coils of the movement, the tapping point of which may be adjusted to give bandwidths from 2 to 600 per cent.

Integral of the error is obtained by feeding the error current through a movement whose deflection is proportional to the magnitude of the error, disturbing the balance of light falling on two photo-cells. The photo-cells form part of a current bridge, the output of which charges the capacitor connected between the bridge and the cathode. The plate current is passed through the coil of the valve positioner.

The voltage across the capacitor represents the integral of the error with respect to time. The integral time is governed by the intensity of light falling on the two photo-cells. It may be varied by a resistor included in the lamp circuit which is calibrated from 0·2 to 60 min.

In order to produce a further component dependent on the rate of change of error, the error current is also caused to pass through a resistor which is connected to a circuit including the appropriate capacitor and resistor. During an error current change, the voltage across the resistor produces a charging current to a capacitor so that a voltage across a resistor is applied to the grid of the tube. A derivative component is thus added to the integral component. The resistor is variable and is calibrated 0–10 minutes of derivative time.

When under manual control, the controller output is fed into a second winding of the movement, in opposition to a manual control current derived from an entirely separate rectified supply which also passes through the valve positioner coil. When the manual control current is varied by a resistor the movement will be unbalanced and the controller output current automatically changed to a value equal to the current passing through the valve positioner coil. Transfer from manual to automatic control may be made, therefore, without disturbing the stability of the process.

A typical controller has a case forming a flameproof enclosure and can consequently be used in hazardous atmospheres. Proportional, integral and derivative adjustments are mounted on the cover of the case with indicators showing controller output and measured value. Further calibrated adjustments are provided for manual control and desired value. Manual or auto control is effected by a three-position switch labelled " Service," " Hand " and " Auto." The " Service " position enables the controller to be attended to while under manual control. The various components are mounted on trays which are plugged into the rear of the case. One tray also includes the thermionic tube and associated power supply of the transmitting unit.

The controller output is fed to the coil of the valve positioner. The coil operates in the field of a permanent magnet and is attached to one end of a pivoted beam, the other end having a flapper covering the nozzle of a low-bleed air relay. The torque exerted by the coil is proportional to the controller output current and is opposed by the torque of a spring which is varied by a lever connected to the valve stem. Any change in output current will unbalance the beam and cause the flapper to move relatively to the nozzle and increase or decrease the air pressure on a diaphragm.

In the balanced condition, the force on a second diaphragm equals that on the first one, but with an increase in pressure on this a hollow plunger is moved and a spring loaded valve is opened to admit air to the head of the control valve. With a decrease in air pressure, the hollow plunger is moved away from its seating and the valve head is connected to exhaust. The valve stem moves in an appropriate direction and varies the torque of the spring until it equals that of the coil. The valve position is directly proportional to the output current from the controller, or 0·15 mA is equal to 3–15 lb air pressure.

Locomotives for British Railways

THE construction programme of British Railways for the present year includes six Co-Co electric locomotives (Nos. 27001–6) for the Manchester-Sheffield-Wath electrified lines. These are being built at the Gorton works. For the Southern Region a further 2,000 h.p. main line diesel-electric locomotive (No. 10203) is being built at Brighton and 54 B.R. standard 0–6–0 350 h.p. diesel-electric shunting locomotives are being built at Derby and Darlington.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Col. J. D. Haigh has been appointed Director of Electronics Research and Development (Defence) and has been promoted acting brigadier. Col. Haigh served in this directorate (then known as the Directorate of Telecommunications Research and Development) from 1946 to 1950 when he returned to the War Office. Since 1953 he has been employed on duties connected with fuze design. Another Ministry of Supply appointment announced is that of **Mr. H. W. Forshaw,** to succeed **Dr. G. W. Sutton** as chief superintendent, Signals Research and Development Establishment, Christchurch. Dr. Sutton is leaving the public service on 31st March. Mr. Forshaw has been Assistant Director in the Directorate of Electronics Research and Development (Defence) since 1947.

Mr. W. H. Taylor, B.Sc., A.M.I.E.E., who was recently appointed controller of education and personnel services to the General Electric Co., Ltd., has now taken up his new duties. Mr. Taylor studied mechanical and electrical engineering at King's College, London, where he graduated in 1937. He obtained his industrial training as a graduate apprentice with the British Thomson-Houston Co., Ltd., Rugby, and remained with that company until shortly before joining the Armed Forces in 1941. He served in the United Kingdom, West Africa and the Middle East, first with the Engineering Branch of the R.A.O.C. and later, on its formation, with the R.E.M.E. By November, 1946, when he was demobilized, he had attained the rank of lieut.-colonel. In April, 1947, Mr. Taylor was appointed education officer on the staff of the I.E.E.

Mr. W. H. Taylor

At the Third Congress of the International Commission on Glass held in Venice last June and July **Dr. E. P. Dudding,** vice-chairman of the Advisory Scientific Panel of the G.E.C. Research Laboratories, was informed that he was to be awarded an honour by the Italian Government in recognition of his services to the Italian glass industry. This has now been confirmed and Dr. Dudding will become an Ufficiale of the Ordine al Merito della Repubblica Italiana. Dr. Dudding was elected president of the Society of Glass Technology in 1934 and became the president of the Second Congress on Glass held in England in 1936. The University of Sheffield conferred on him the honorary degree of Doctor of Philosophy in 1939. He is a Fellow of the Institute of Physics, a Fellow of the Royal Statistical Society, and a founder Fellow of the Society of Glass Technology. He became hon. secretary of the Institute of Physics in 1946 and hon. secretary of the International Commission on Glass in 1950. He was president of the latter body.

Mr. M. Campbell Jones, chairman of Peto Scott Electrical Instruments, Ltd., has resigned from the board in order to concentrate on other activities and two other directors, **Mr. A. G. Benstead** and **Mr. R. N. Martineau,** have also resigned. **Mr. C. F. Hollamby** and **Mr. A. Meredith-Owens** have been appointed directors and Mr. Hollamby has been elected chairman. **Mr. J. F. Veevers,** who joined the board a year ago, will continue as managing director.

A number of appointments and reappointments to the East Midlands Electricity Consultative Council are announced by the Minister of Fuel and Power. Members of the Council include the following:— **Mr. A. Brookes,** M.Eng., M.I.E.E. (Beeston), **Councillor C. E. Fry,** A.M.I.E.E. (Skegness), **Maj. H. E. Knight,** M.I.E.E., C.C. (Kettering), and **Mr. F. V. Pipe,** O.B.E., A.M.I.E.E. (Derby).

Mr. R. W. Ayers, managing director of Sciaky Electric Welding Machines, Ltd., has returned to England from South Africa where he has been studying engineering companies and their resistance welding problems.

Mr. S. R. Bond, lately district manager at Nottingham for the Edison Swan Electric Co., Ltd., has joined Harris & Sheldon (Electrical), Ltd., as sales development engineer for the East Midlands.

Mr. G. D. Niece has been appointed managing director of Dictograph Telephones, Ltd., with **Mr. J. H. Whitfield.** Mr. Niece has been a member of the board for over fifteen years and has been associated with the present company and its predecessor for thirty-five years.

Mr. C. C. Thrall, secretary of the Leicester Sub-Area of the East Midlands Electricity Board, is to retire at the end of this month after forty-four years' service with the Leicester electricity undertaking. He is to be succeeded by **Mr. J. A. Steeples,** the present assistant secretary, who has forty-two years' service.

At the annual meeting of the British Refrigeration Association on 19th March, it was announced that **Mr. Thomas Whittaker** had been appointed as the new director of the Association in succession to **Mr. E. G. Batt.** Mr. Whittaker has hitherto been assistant director of the Electric Lamp Manufacturers' Association. During the war he was commissioned in the Royal Artillery. He is a barrister-at-law, having been called to the Bar of Inner Temple in 1951.

Mr. T. Whittaker

As from the beginning of the year the vacuum product activities of the Metropolitan-Vickers Electrical Co., Ltd., have been merged with the New Products Department, which has been renamed the Scientific Apparatus Department. The officers of that department are **Mr. J. W. Buckley,** M.C., M.Sc., A.M.I.E.E., F.Inst.P., sales manager, **Mr. W. J. Brown,** B.Sc., A.M.I.E.E., assistant sales manager, **Mr. J. Blears,** B.Sc.(Eng.), A.M.I.E.E., Assoc.M.C.T., chief engineer, and **Mr. R. S. Clark,** A.M.I.Mech.E., A.M.I.Prod.E., assistant superintendent. Mr. Brown joined the company in 1946 and was appointed assistant to the sales manager, New Products Department, in 1951.

Mr. Blears joined the Metropolitan-Vickers Co. as a special trainee in 1936 and then entered the physics section of the Research Department. After carrying out investigations on thermal transformations in alloys he turned during the war to work on proximity fuze design followed by the develop-

Mr. W. J. Brown

Mr. J. Blears

Mr. R. S. Clark

ment of magnetrons for centimetre wavelengths. By 1943 he had started investigations in high vacuum phenomena leading to the company's developments in mass spectrometers, and in 1948 he took charge of the vacuum physics section. Mr. Clark joined the company as a college apprentice in 1938. He then became a junior production engineer in the M-V aircraft works, and was later appointed chief production engineer in the Undercarriage Department. After the war he transferred to the Plant Department, becoming manufacturing engineer in charge of the vacuum products (rectifier and X-ray) section, and on the transfer of this section to the Barton Dock Works towards the end of 1951 he was appointed assistant superintendent.

The Ministry of Supply announces that **Dr. J. W. Drinkwater,** O.B.E., has been appointed Director of Engine Research and Development in succession to **Mr. R. H. Weir** who recently became Principal Director. Dr. Drinkwater has held the appointment of Assistant Director since 1948.

Mr. Arthur E. Skan, a director of the Ellison group of companies (George Ellison, Ltd., Tufnol, Ltd., and Alfred Ellison, Ltd.) has been elected chairman of the British Plastics Federation. He has represented Tufnol, Ltd., on the Federation since 1934, having been vice-chairman since 1952, a member of the council since 1939 and chairman of the Laminated and Fibrous Products Group on three occasions. He is also a member of the Council of the British Electrical & Allied Manufacturers' Association and other bodies.

Mr. A. E. Skan

Mr. C. E. Hollingworth, B.Eng., M.I.E.E., will take up the appointment of manager of the Maidstone District of the South Eastern Electricity Board on 1st June. He is at present district manager, Stevenage, with the Eastern Electricity Board.

Mr. E. Conlon, senior assistant in the Purchasing Department of the South Wales Electricity Board, has been appointed first assistant to the district commercial manager, District 347 (Cardiff East) in succession to **Mr. H. B. Holloway,** B.Sc., A.M.I.E.E., who was recently appointed district commercial manager, District 346 (Rhondda, Ely Valley).

Mr. W. S. Tyrrell, Staines District engineer of the Southern Electricity Board, has retired after nearly fifty years' service. At a dinner arranged by the Egham and Staines Electricity Sports and Social Club, Mr. Tyrrell was presented with a "Teasmade" set by Mr. F. C. Oldcorn, sub-area manager, on behalf of colleagues in the Staines district and Southall Sub-Area. Mr. Tyrrell started his career with the Egham Electric Lighting Syndicate when it was formed in 1904. He remained with the undertaking during its various changes.

The president of the Electrical Power Engineers' Association for 1954-55 is **Mr. Ernest Hanson,** second assistant engineer (construction and maintenance) with the Yorkshire Electricity Board. Mr. Hanson saw service in the 1914-18 war with the 19th Yorkshire Regiment and was commissioned in the field. He had received preliminary practical training as an engineer before enlistment, and on return from war service in 1919 completed his training. Afterwards he went overseas, being until 1928 in the Middle East with the old Anglo-Persian Oil Co. Returning to this country in 1929, Mr. Hanson had a varied experience with several contracting firms until 1935, when he joined the staff of the former Yorkshire Electric Power Co. Mr. Hanson has been chairman of his E.P.E.A. section since 1947, a member of the Area Investigation Committee and Joint Board from 1946, and was elected to the National Executive Council for the first time in 1947. He is a member of the National Joint Board and the National Joint Advisory Council for the Electricity Supply Industry.

Mr. John H. Appleby, A.M.I.E.E., M.I.Mech.E., has accepted a position with La Electricidad de Caracas, and leaves for Venezuela in April. Mr. Appleby was for some time chief electrical engineer, Public Works Department, Punjab Government, Pakistan.

Mr. R. E. Cranston, joint managing director of Line Equipment, Ltd., has left this country for a short visit to South Africa. While there he will be making contact with the company's South African representatives, H. E. Bell (Pty.), Ltd.

In our last issue we reported that **Mr. S. J. Beaney** had been appointed secretary of W. T. Henley's Telegraph Works Co., Ltd., to succeed **Mr. R. F. Gyngell,** who is retiring at the end of this month. We now reproduce Mr. Beaney's portrait herewith.

Mr. S. J. Beaney

Mr. R. Mills, A.M.I.E.E., has been appointed deputy superintendent at Keadby power station, Yorkshire Division, B.E.A. He will be taking up his new duties on 12th April. Mr. Mills is at present shift charge engineer at Uskmouth power station.

Mr. R. E. Connold, for thirty-three years chief electrician to Oetzmann & Co., Ltd., is retiring on 31st March. **Mr. R. McGill,** Mr. Connold's assistant for thirty-two years, is taking over from that date.

Mr. G. H. Rosam, overseas manager of Parnall (Yate), Ltd., is at present abroad on an extensive tour of Canada, the United States and Mexico. During this tour he will cover nearly 18,000 miles.

Mr. R. H. Lancaster, M.S.M.A., has been appointed sales manager of Vactric, Ltd. He was formerly sales manager of Nash Kelvinator, Ltd. In addition to Vactric sales Mr. Lancaster will be in charge of the company's advertising and sales promotion for the United Kingdom. He has been associated with the electrical appliance trade for eighteen years.

Mr. R. H. Lancaster

Mr. H. F. Lidster, Associate I.E.E., district commercial manager South Bristol for the South Western Electricity Board, has been appointed district consumers' engineer for the North Western Electricity Board's South West Fylde District based on Blackpool. Mr. Lidster, who succeeds **Mr. H. T. Timberlake,** who was recently appointed manager of the West Bromwich District of the Midlands Electricity Board, joined the Consett Iron Co., Ltd., as an apprentice in 1918, and subsequently served with the Newcastle-upon-Tyne Electricity Supply Co., the West Hampshire Electricity Supply Co., the Settle & District Electricity Supply Co., Ltd., and the Exe Valley Electricity Co., Ltd., being engineer and manager for North Devon and West Somerset with the last mentioned company. He joined the South Western Electricity Board on nationalization in 1948, and was appointed to his Bristol post in 1950.

At the Fortune Theatre, London, W.C., last week the **G.E.C. Dramatic Society** presented "Madam Tic-Tac" a drama by Falkland L. Cary and Philip Weathers. In the name-part Florence Scantlebury displayed her usual competence and she was ably backed by Shirley Linge, Doreen Webb, Barry Ramsay, Frederick Coker, Keith Clifton, Frederick James, Bill Bulline, Gwen Rogers, Elizabeth Barber and Phyllis Gould. Evelyn Watts was the producer. The proceeds from the box-office and donations from the audience are going to the Electrical Industries Benevolent Association.

Another excellent "Music for All" choral and orchestral concert was given last Monday evening by the **Leyton Music Society,** under the auspices of the London Electricity Sports and Social Association, at St. Pancras

At the annual ball of the Hants and Dorset Branch of the E.I.B.A., showing (left to right): Mr. H. Senior Fothergill, secretary of the Association, Mrs. R. H. Coates, Mr. H. A. Deacon, chairman of the Court of E.I.B.A., Mrs. Deacon, the Lord Mayor of Portsmouth, Councillor Miles, Mrs. Hubback, wife of the Admi. Supt. H.M. Dockyard, and Mr. R. H. Coates

Town Hall. The main orchestral work was Beethoven's No. 1 symphony in C major, and under the conductorship of Leslie Atkins the orchestra gave a satisfying performance. The choir (conducted by Douglas Sharpe) gave two groups of songs and was particularly good in "All in the April Evening," by H. S. Robertson (unaccompanied), and "The Lass with the Delicate Air," by Michael Arne (arranged by John E. West). Other works were Weber's overture "Der Freischutz," "Tubal Cain" (T. Dunhill), for chorus and orchestra, "Die Fledermaus" overture (Strauss), and "La Source" (Delibes-Minkaus), and a well-balanced programme was concluded with the suite "Mlada" (Rimsky-Korsakov).

The annual dinner and dance of the **Manchester Association of Engineers** was held at the Grand Hotel, Manchester, on 12th March and was attended by 330 members and guests. The president, Prof. H. Wright Baker, D.Sc., M.I.Mech.E., was in the chair. The toast of the president was proposed by the ex-president, Mr. C. Gordon Huntley. The guests represented many of the local branches of other institutions.

On 1st March, the **Enfield Cables & Rolling Mills Social Club** visited the "Sinbad the Sailor" Ice Show at the Empress Hall, Earls Court. This was the first outing organized by the Club for many years and 340 people travelled in nine coaches. Members of the club were introduced to the cast during the interval.

The Hants and Dorset Branch of the **Electrical Industries Benevolent Association** held its fourth annual ball on 4th March at the South Parade Pier, Southsea, some 400 members, friends and guests attending. Official guests were entertained by Mr. W. Stearn, the Branch president from Southampton, and Mr. R. H. Coates, the Branch manager from Portsmouth. Guests included the Lord Mayor of Portsmouth, Councillor F. Miles, Mr. H. Senior Fothergill, secretary of the Association, the president, Mr. H. A. Deacon and Mrs. Deacon, Mr. R. B. Brown, Admiral and Mrs. Hubback, Mr. and Mrs. E. Kill, Mr. and Mrs. K. W. Fletcher and Mr. and Mrs. T. G. Moore. During the evening sixty prizes given to the Association were distributed, and there was a cabaret. The M.C. was Mr. W. Gresham. The event resulted in over £300 being raised for the funds of the Association.

OBITUARY

Mr. A. W. Jones.—A former chief designer at the works of Brush Electrical Engineering Co., Ltd., Loughborough, Mr. Alexander William Jones died at his home, "The Nook," Wymeswold, Leics, on 15th March at the age of eighty-seven. Mr. Jones joined the Anglo-American Brush Co., Ltd., at Victoria Works, Lambeth, and in 1889 when the company acquired the Loughborough works he moved to Loughborough and became chief designer in the electrical drawing office. Subsequently he left the company and after the 1914-18 war he became a consulting engineer with offices in Loughborough.

Mr. Guy Burney, who was for many years managing director of the Sterling Telephone & Electric Co., died on 17th March at the age of eighty-three. He was the founder and the first chairman of the Telephone Manufacturers' Association.

Mr. J. H. Bobinson.—The death occurred on 21st March, at the age of seventy-five, of Mr. Joseph Hamilton Robinson, A.M.I.E.E., of Worthing.

Mr. William John Williams, late electrical adviser to the Federated Malay States Government, died on 19th March.

WILLS

Mr. K. H. R. Lauben, a director of E.M.I. Sales & Service, Ltd., who died on 25th November last, left £3,973 gross (£2,755 net).

Mr. J. H. Castell, designer of the special locks and interlocks for switchgear, late consultant for Castell Locks, Ltd., formerly with the British Thomson-Houston Co., Ltd., who died on 9th November last, left £24,608 gross (£23,833 net).

Mr. C. H. Nunn, manager of the transformer works of the General Electric Co., Ltd., who died on 22nd December last, left £11,406 gross (£11,339 net).

Mr. H. Gawthorne, formerly a director of Brookhirst Switchgear, Ltd., who died on 25th October last, left £13,456 gross (£13,249 net).

Transatlantic Cable

The Post Office has placed an order with Submarine Cables, Ltd. (owned jointly by Siemens Bros. & Co., Ltd., and the Telegraph Construction and Maintenance Co.) for about 90 per cent of the first of the two projected transatlantic telephone cables, particulars of which were given in our issue of 11th December last.

The value of the contract is said to be about £2 million; the cable, about 2,000 miles long, will be made at the new Erith factory and will be laid next year by the P.O. cable ship *Monarch*. The remainder of the cable will be produced in the United States.

Argentine Power Scheme

The Argentine Ministry of Industry and Commerce has announced that a large new generating station at San Nicolas, which is being built under the second five-year plan, will begin partial operation during the first half of this year. San Nicolas is situated on the River Parana, about 50 miles below Rosario. The Ministry states that about 200 million pesos has already been spent on this plant, which will have an ultimate capacity of 320 MW. Electricity will be transmitted to Buenos Aires, Rosario and Santa Fe over some 500 km of high-voltage lines.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM Ingots	ton £156 0s 0d
COPPER, H.C. Electro	ton £236 0s 0d
Fire Refined 99·70%	ton £235 0s 0d
Fire Refined 99·50%	ton £234 0s 0d
COPPER Tubes ..	lb 2s 3½d
Sheet	ton £294 0s 0d
H.C. wire and strip	ton £265 10s 0d
LEAD, English ..	ton £87 15s 0d
Foreign	ton £86 0s 0d
MERCURY	flask £69 0s 0d
TIN, block (English) ..	ton £747 10s 0d
ZINC, G.O.B. Foreign	ton £75 10s 0d
Electrolytic	ton £80 0s 0d
BRASS Tubes (solid drawn)	lb 1s 10¾d
Sheet	ton £239 0s 0d
Wire	lb 2s 5¾d
PHOSPHOR BRONZE Wire	lb 3s 8¾d
PLATINUM	oz £30 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 16¾d–16¼d

Supply in Southern Rhodesia

Progress of Commission's Service

By DOUGLAS SPENCER

SINCE the publication of my notes on the sixteenth annual report of the Electricity Supply Commission of Southern Rhodesia in the *Electrical Review* of 20th February, 1953, the federation of Southern and Northern Rhodesia and Nyasaland has become an accomplished fact. It is excusable to mention such a subject because the consolidation of the three territories into one has resulted in facilitating financial operations for one homogeneous body of federated states.

Reference was made in the article mentioned above to the possibility of federation and the development of water power, as follows:—"The development of water power first on the Kafue and Zambesi Rivers, should, if federation is achieved, without doubt have one of the first claims on the large amount of capital which will have to be raised in such a quickly developing territory." Now it has been decided by the Northern Rhodesian Territorial Government and the Central Federal Government to proceed with the Kafue scheme, which is said to be in the hands of one of the mining and finance corporations. The copper mines will be amongst the larger consumers of power from this £35 million scheme.

Financial Results

The operations of the Electricity Supply Commission in the year ended 31st March, 1953, resulted in the sale of 411 million kWh, an increase of over 56 million compared with the previous twelve months. Revenue and cost figures for the two years were as follows:—

	1951–52	1952–53	Inc. or dec.
	£	£	per cent
Revenue	1,247,539	1,530,696	+22·69
Total production costs ..	1,189,710	1,526,368	+28·30
Excess of revenue ..	57,879	4,328	−92·50
Cost of coal	289,059	378,771	+31·95

The total plant capacity is now 94,870 kW, and a further 90,000 kW is under construction or on order. The transmission and distribution system increased by 558 route miles to 6,006. The widespread nature of the supply system considering the small population of the country caused a great deal of surprised and favourable comment on the part of visitors to the Rhodes Centenary Exhibition. It is remarkable how in every channel of consumption such large increases have taken place. Comparable figures for various industries for the years 1948–49 and 1952–53 are as follows, in millions of kWh consumed:—

	Mining	Municipal	Farming	Domestic and Lighting	Industrial
1948–49..	123	25	3·5	4	16·5
1952–53..	223	93	14·5	17	63

From these figures it will be obvious what a good market exists for plant and appliances manufactured in the "Old Country," especially with the extra 90,000 kW in view.

The tariffs for farms are such as to give every encouragement to the wide use of electrical plant. However, when it comes to encouraging connections and consumers and the feasibility of extensions it is natural to consider the "payability" of the operations and the possibility of increased cost. The Commission, according to its Act, has to work on a non-profit and no-loss basis and in view of this a comparison of the various percentage costs of the various items making up the total production cost during the last two years is interesting (certain amounts of power are purchased from municipalities):—

	1951–52	1952–53
	per cent	per cent
Generation	36·2	36·7
Capital	30·6	29·1
General expenses	12·0	11·4
Distribution	7·4	7·9
Electricity purchased	13·8	14·9

The figures for 1953–54 will be a better indication of the future of the Commission's operations, as the price of coal will be stabilized at a lower level than the 19s ruling in the earlier part of 1953, and the increase in the monthly minimum rate for farmers from 70s to 110s will bring better results in the Salisbury and Umtali areas. A wise economy, also, has been introduced by the method under which farmers and other consumers are now reading their own meters and making returns of the power consumed, subject to an occasional check by the authorities. This means the reduction of transport charges, in many cases cutting out journeys of 100 miles in country districts.

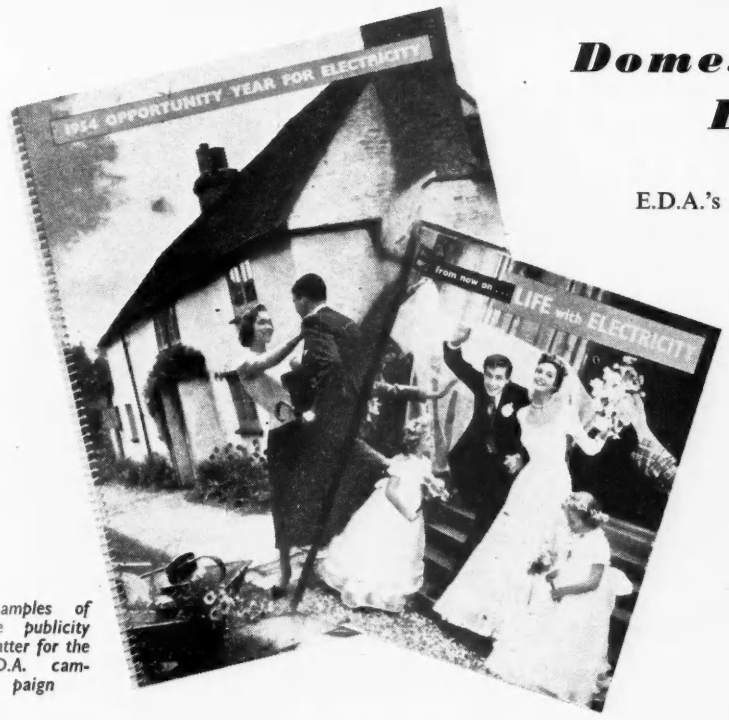
Shortage of trained staff and apprentices is a frequent cause of delay in construction work. Staff vacancies are frequently occurring and the life of apprentices on the various sections is certainly full of interest. The total number of Europeans at the head office and throughout the country increased from 473 to 531 and the number of natives reached a total of 2,144.

The Kariba Project

Reference has already been made to the Kafue development. The Kariba Gorge scheme, which is estimated as likely to cost some £75 million, is of a more comprehensive nature as it is also intended to provide for the irrigation of a very large area of land in the Zambesi Valley for the planting of sugar and cotton and other crops. Trial plantings of sugar cane have already been made. The Gorge is well within reach of wide industrial districts and the power to be developed is likely to open up further mining activities, which are at present held up by lack of power. In view also of the successful agricultural experiments in the Sabi Valley it is quite possible that power development will take place there to augment the supply to industries and towns on the Portuguese border.

Domestic Electrification

E.D.A.'s AMBITIOUS CAMPAIGN



Examples of the publicity matter for the E.D.A. campaign

AN advertising campaign on a scale which has been impossible since before the war has been embarked upon by the British Electrical Development Association. It is not only extensive in scope, it has a basic "message" attractively put over.

The keynote is "The Four Foundations of Modern Living," that is, the electric cooker, the electric water heater, the electric washing machine and the electric refrigerator. A story is told in pictures of a young couple contemplating matrimony, getting married and settling down. The text accompanying the large photographic reproductions is easily digested.

Half-page advertisements are being published monthly for six months in five of the leading national dailies with a combined circulation of over 14 million. During this period full pages will appear in the *Radio Times*, which is read in nearly eight million homes, and similar announcements will also be made in full colour in 34 national magazines with a total readership of over 16 million.

Simultaneously double-crown (20in by 30in) posters will appear and the same designs will be available in showcard form. Other media to be employed are two new films ("Kitchen Planning" and "Electric Cooking") and an earlier one—"Boiling and Simmering"; three-colour stickers for envelopes, etc.; "mobiles"—coloured hanging devices which are in constant animation; a well-illustrated booklet "Life With Electricity" in which descriptions of the appliances with hints on choice are given; and a stereoscopic ("3-D") viewer and slides for use in Electricity Boards' showrooms, etc.

In all of this material the reader's steps are directed towards the nearest Electricity Service Centre thus forming a link with the Electricity Boards, encouraging them to adapt their publicity arrangements to fit in with the campaign.

Seaside Illuminations

THE planning of the seaside outdoor illuminations undertaken by the Blackpool Corporation was dealt with in a lecture by Mr. H. Carpenter (illuminations engineer and public street lighting officer, Blackpool Corporation) to the Liverpool Centre of the Illuminating Engineering Society on 16th March. He said that during 48 days the 1953 illuminations attracted 3¼ million visitors and were estimated to have brought £3 million to £4½ million worth of business into the town.

Electricity Boards were usually keen to help to provide supplies at suitable tariffs. This policy should continue, because decorative lighting was a pleasant and attractive public amenity and gained publicity for electric lighting while often providing valuable summer-time off-peak loads.

At Blackpool there was a permanent network of h.v. and l.v. cables, and the supply was taken mainly in bulk from the Electricity Board. Because of the 2,200 kW loading three-phase distribution was necessary, and great care was required in technical planning to avoid danger to the public and operators. In addition, there was the ever-present risk from equipment mounted near to the ground, and, although precautions were taken, and wherever possible displays were fenced off, there remained the problem of the souvenir hunter.

In planning, therefore, the problem of operational continuity was of prime importance and an efficient maintenance patrol was essential to avoid unlighted features and sections, which were detrimental to any display and certain to evoke criticism.

All new projects should at least make arrangements for suitable electricity cabling and supply points so that illuminations could be put into service more easily and cheaply, and so be used more often. Architects, in consultation with lighting engineers, should have decorative lighting in mind when designing all new public buildings, and, if possible, make provision for changes of lighting treatment. Civic centres, and the like, could be improved by using permanent floodlighting. Although the extensive display at Blackpool was free to the public, the cost to the town was only about 6d per visitor, a small price for a unique spectacle.

Lighting Fittings Makers

Speeches at Annual Luncheon

AT the annual luncheon of the Electric Light Fittings Association at the Piccadilly Hotel, London, on Tuesday the first toast was that of the guests. It was proposed by Mr. L. G. Lewzey, T.D., who referred particularly to the presence of Mr. Hugh Molson, Parliamentary Secretary to the Ministry of Transport and Civil Aviation. He thanked the Ministry for its consistent support and encouragement of the Association in its endeavours to make the roads safer during the hours of darkness. He also praised the Association of Public Lighting Engineers (represented by its president, Mr. C. C. Smith) for its magnificent work during the past half-century.

Mr. C. C. Smith, in his response, expressed his appreciation of such functions as the luncheon as a means of getting the various sections of the industry together and stimulating discussion.

The toast of "The Electric Light Fittings Industry" was proposed by Mr. Molson who spoke of the need for the better lighting of roads to reduce accidents. Since the war expenditure had been restricted but now about £4 million a year was being spent on road lighting and it was hoped that more would be available for trunk roads. The members of the Association were technically in the forefront of the world's lighting industry.

The president, Mr. Cecil Hughes, who was in the chair, replied to the toast. He stressed the need for uniformity in street lighting; good lighting speeded up traffic without undue risk. The Association's function was to ensure the proper distribution of light. Sometimes there was a conflict between efficiency and æstheticism; there had to be a reasonable compromise but distribution was of primary importance. Lighting costs were too often regarded as the main consideration, which was wrong. Mr. Hughes thought that there should be greater co-ordination between the civil engineer and the lighting specialist to ensure a better uniformity of road surfaces from the reflection point of view.

Although he had concentrated on street lighting, that was only one aspect of the Association's work. Members were also leading the world in the design of industrial, commercial and other forms of lighting equipment.

Proposing the toast of "The Past Presidents," Mr. A. Mansell referred to the work on behalf of the Association of Messrs. J. N. Stephens, F. Winstanley, A. E. Iliffe, A. J. Burbidge, F. W. Norris and K. Scott Adie and the late Messrs. Priest, Dean and Harvey. Their efforts had resulted in binding together forty firms with different interests.

In the course of his reply, Mr. F. Winstanley recounted the story of the Association's foundation which had its origin in the Alabaster Bowl Co., formed by five manufacturers. Among its achievements had been the standardization of discounts and the abolition of the sale or return system. He paid a tribute to Mr. Felix Rogers for his invaluable services and referred to Mr. Rogers' successor as secretary, Mr. J. H. Campion. In such an Association as theirs, individual firms' prejudices had to be subordinated to the good of the industry as a whole.

REPORT FOR 1953

IN his report for the past year Mr. Cecil Hughes (who has been re-elected president for a further term) says that on the whole the year was a reasonably good one for the lighting fittings industry. Turnover was maintained in an increasingly competitive market and prices generally remained stable. Building programmes helped in the domestic, industrial and commercial spheres.

Controls on zinc, nickel and nickel plating were removed during the year. Although steel was also decontrolled certain qualities of sheet steel are difficult to obtain but there is a prospect of an improvement in the next few months.

Although the general reductions of purchase tax introduced in the 1953 Budget was welcome the present rates are still unreasonably high and are a serious handicap to good lighting. The essential nature of all lighting fittings demands the complete removal of the tax.

After deprecating the decision of the Board of Trade to discontinue the collection of commercial statistics for lighting fittings the report refers to the increasing importance of the Association's technical work.

Increasing competition and import restrictions have prevented any general extension of export trade although all E.L.F.A. members are doing their utmost to maintain the export position. Nevertheless by providing efficient lighting in industry the Association is making an important indirect contribution to export trade. It is regretted that the Government has decided to admit a quota of Japanese lighting fittings and it is hoped that economic circumstances will soon change to render any repetition of this unnecessary.

The Association has replied to a lengthy questionnaire from the Monopolies and Restrictive Practices Commission and is ready to provide any further information. Collaboration with other bodies in the Electrical Fair Trading Council continues. A very restricted number of albums of photographs has been produced to exhibit some examples of the very wide range of fluorescent fittings made by members.

At the end of the year the membership was 45; the section membership (some are in more than one section) was as follows:—Decorative Fittings, 26; Commercial Fittings, 27; Industrial Fittings, 33; Street Lighting, 17. Friendly collaboration with all bodies with associated interests has continued and regular close contact has been maintained with Government Departments.

Members of the Industrial Fittings Section have devoted much attention to adjusting trade policy to meet modern conditions and to encouraging the widest range of designs to cover consumers' needs, particularly in fluorescent lighting. The Street Lighting Section has been active in completing a technical Code of Practice and its trading policy in consultation with the Association of Street Lighting Erection Contractors. All fluorescent lighting fittings subject to purchase tax are now dealt with by the Commercial Fittings Section.

Smoke Abatement

The Proceedings of last year's Glasgow Conference of the National Smoke Abatement Society (30, Grosvenor Place, London, S.W.1) are now available at 7s 6d net. Among the subjects of the papers and discussions reported are: the London fog disaster, 1952; solid smokeless fuels; fuel oils; smokeless zones; atmospheric pollution in relation to preventive medicine; and smoke and the local authority.

INDUSTRY AND THE HOUSE

Proposed City of London Smokeless Zone

By A. M. F. PALMER, A.M.I.E.E., M.P.

A RECENT Private Bill discussed by the House was the City of London (Various Powers) Bill to empower the City Corporation, among other things, to establish a so-called " smokeless zone."

Sir Herbert Williams moved a " token " amendment to delete the smokeless zone clause; in his apology for so doing he said his purpose was to raise a debate on air pollution. He described the four thousand deaths last winter under heavy fog conditions as a major tragedy, but argued that scientific knowledge so far was inadequate to find the exact solution. In Sir Herbert's view the major trouble was sulphur dioxide; combined with moisture it produced sulphurous acid, plus a little more oxygen from the air it became sulphuric acid. This was the main cause of the corrosion of exposed metalwork and of the outside deterioration of buildings. He agreed that some efforts had been made to reduce sulphur dioxide emission from London power stations. Three stations had had plant designed for the purpose; Fulham, Battersea and Bankside. In Sir Herbert's judgment these efforts had not only failed, but worse, they had aggravated the problem. He cheerfully invited Members of the House to take a stroll on the Chelsea Embankment and stare at the tops of the Battersea power station chimneys. If they did so they would find that instead of the smoke shooting heavenwards it was pluming downwards in a white cloud. It was true that 85 per cent of the sulphur had been removed, but the amount of grit coming back to Mother Earth and her inhabitants was now greater than ever. This example, thought Sir Herbert, showed the complexity of the problems involved.

When the Member for Croydon East had finished Members could agree that they had been given an entertaining lecture on popular science, even if it lacked positive conclusions.

Dr. Barnet Stross, a medical man who represents Stoke-on-Trent in the Labour interest, said that although he was glad that the City of London was to clean itself up, the prevailing wind was such that the City would probably get less benefit than its neighbours. To ensure the very best results a smokeless area was needed for Westminster, Fulham, Chelsea and Kensington. The Government, he thought, should force local authorities to act more quickly.

Lancashire Example

Sir Robert Cary, a Conservative who represents Withington, Lancashire, referred to the experience of that great metropolis of the north as pioneers in smokeless zone experiments. He said that long negotiations both with occupiers of houses and users of fuel, and with the various public Boards, had to be undertaken before eventually in an area of 105 acres Manchester was able two years ago to establish its central smokeless zone. The scheme had been so successful that it was now intended to extend the area involved to between 450 and 500 acres. In a reference to smoke in another context Sir Robert told the story of the American who was so horrified by what he had read in the newspapers about the dangers of smoking that he gave up reading!

The debate was continued by Members mainly representing constituencies with an air pollution problem. Mr. Marples, Parliamentary Secretary to the Ministry of Housing and Local Government, who replied from the Front Bench, said the Government hoped the Bill would go through. They were determined to conquer the evil of air pollution and would welcome carefully planned expansions of the smokeless zone principle. It was estimated there were still twelve million houses with open fires, which was far too many. The Government proposed to persuade as many local authorities as possible to display for several months improved fuel-saving, smoke-eliminating appliances with details of weekly running expenses.

A useful discussion having been provoked, the motion was by leave withdrawn.

Atomic Energy Bill in Committee

On Wednesday last the House considered the Atomic Energy Authority Bill in Committee. Mr. George Darling started the discussion, which took the House after several hours to the end of Clause 1, by moving an amendment to make the Minister of Supply responsible for the appointment of members of the Authority instead of the Lord President of the Council. This was, of course, to reopen the Second Reading discussion on one of the main principles on which the Government's proposals rest, and it was not surprising therefore that the amendment was strongly resisted. Calling the Ministry of Supply the " natural partner " of atomic energy organization, Mr. Darling said it was wrong for the Minister of Works, the " building contractor," to be answerable for the whole enterprise in the House of Commons. Supporting the amendment Mr. George Strauss, Labour's ex-Minister of Supply, denied that his old department was a military department only. It was primarily concerned with the great engineering industries, their welfare and research. Here were the obvious people to run atomic energy rather than a coalition of the Lord President of the Council with the Minister of Works.

The Government's defence of their arrangement was that the Lord President of the Council was responsible for science generally and closely in touch with universities and research organizations. He had detachment from the competing claims of other Ministers, including the Minister of Fuel and Power; in addition, unlike the Minister of Supply, he had, normally, a seat in the Cabinet. The amendment was defeated on a division by a smaller than usual Government majority of twenty.

An obviously sensible amendment moved by Mr. Beswick asked that one member of the Authority should be appointed from among persons with a wide experience of the organization of workers—in short a trade union man. The acceptance of this amendment rectified a surprising omission in the Bill; nobody can seriously doubt that on the whole the leading trade union personalities

who serve on the Boards of publicly-owned industries have justified themselves. The Minister was guiltily glad to have the opportunity to put right the slip, if slip it were.

It is not the normal habit of the writer to mention matters with which he has been directly concerned, but in view of its interest an amendment to place on the Board of the Atomic Energy Authority someone with experience in the generation and supply of electricity can be mentioned. The wording of the amendment suggested that the appointment should be made " after consultation with the Minister of Fuel and Power."

The intention was to probe the Government's plans for developing the most important peaceful use of nuclear energy. And in this it succeeded. Sir David Eccles, the Minister of Works, said that if a representative of any one section of users had a statutory right to a seat on the Board claims for similar representation would come from other users. That, he thought, would produce an Authority too large for the best organization of the business. Instead the Government preferred to try to secure the best possible co-operation from the electricity authorities in the advance towards this new form of power by other methods. Already one of the staff of the British Electricity Authority had been at work at Harwell and the B.E.A. had been invited to send teams of engineers to work with the new industrial group at Calder Hall. It was very necessary, he agreed, that reactor technology should be studied by those who were going to design, construct and operate reactors for power station use. The amendment was withdrawn.

Dangerous Use of Electricity

Some Legal Effects of Amateur Extensions to Installations

By C. F. MAYSON, A.M.I.E.E.

A SHORT while ago a widow with three young children was awarded damages totalling £3,750 in the Queen's Bench Division of the High Court because her husband had been electrocuted whilst digging a drainage trench in a garden. The case was *Gilbert* v. *Coward and Sharman* and, as it raises some points of law which are of general interest and importance, it may be profitable to examine the facts and the legal implications.

Mr. Gilbert was a builder employed by Mrs. Coward to do some drainage work in her garden. When engaged on this work he struck a buried cable and lost his life. This cable had been laid some twelve years before by Mr. Sharman, then a young man living with his parents in the house next door. The Cowards took a supply of electricity from the mains; the Sharmans did not. The latter had a radio set and, presumably because he was tired of constantly renewing batteries and charging accumulators, Mr. Sharman thought of the idea of connecting the set to the mains from the Cowards' supply. With the neighbours' concurrence he carried out his idea and buried a cable in the two gardens between the houses.

At the time when Mr. Gilbert was working in her garden, Mrs. Coward knew that the cable was there, but did not mention the fact to him, possibly thinking that it did not matter. Obviously she did not know what many people do not know, and that is that, if you invite someone on to your premises for a purpose in which you both have a business interest, it is your duty to warn that person (who, in law, is your " invitee ") of any unusual danger about which you know *or ought to know*. The significance of those last words is that knowledge of the danger will be attributed to the occupier of the premises where that danger is, whether or not he does, in fact, possess that knowledge. The danger must, of course, be " unusual." One does not expect to find a cable buried in a garden, unless it is a service cable, in which case it will be properly protected either by earthenware conduit or by tiles and will not be unusual.

On the other hand, the invitee must take reasonable care for his own safety. If Mr. Gilbert had had to break through a conduit pipe to reach the cable he could not be said to have taken the care required of him. But there is no doubt that he was a skilled and careful man, and the cable which he had found was certainly in the class of unusual dangers.

Not having warned Mr. Gilbert of the existence of this cable, Mrs. Coward was responsible to him as her invitee for any injury resulting from his contact with that unusual danger. But what of Mr. Sharman? It is a rule of law that anyone who creates a danger on another's premises is responsible for injury to all others who are lawfully there. Mr. Gilbert was rightfully on the premises and the cable had been laid by Mr. Sharman, who had thereby created a danger. Mr. Sharman was unskilled in the laying of cables, but that afforded him no excuse, for even had he been a qualified engineer he would have been responsible. Naturally, if he had laid the cable in accordance with recognized practice and had used the skill and care normally attributed to and possessed by persons who lay cables, he might not have created a danger (although, had that cable become dangerous subsequently, he could still have been held liable, unless he could have shown that the dangerous state had been caused by the act of some other person).

In the result both Mrs. Coward and Mr. Sharman were held responsible for Mr. Gilbert's unfortunate death, and they were ordered to share the payment of damages between them.

This case should serve as a warning to " amateur " electricians, whether or not they are paid for their work. It might also help to deter consumers from employing such persons in order to save money. Mr. Justice Devlin, who tried the case, pointed out that the occupiers of houses should know about the electrical installations and their potential dangers, and stressed the fact that those who did work on them without having the necessary skill would be negligent if they created a dangerous state of things. His Lordship's words should encourage electrical contractors and others who work for better installations and greater safety, by providing a thoroughly sound argument in support of regular inspection and maintenance.

PARLIAMENTARY REPORT

WHEN the Atomic Energy Authority Bill was considered in Committee, Mr. George Darling moved an amendment to make the Minister of Supply responsible for the appointment of the members of the Authority instead of the Lord President of the Council. He said that to make sure that the relations between the Government and the Authority were clear and efficient and could be usefully developed, the Authority ought to work closely with its natural partner, the Ministry of Supply, and, in order to avoid departmental friction, the members of the authority ought to be appointed by the Minister of Supply.

After some debate, Sir David Eccles, the Minister of Works, resisting the amendment, said that its acceptance would lead to the absurd position of one Minister appointing the members of the Authority and another paying them and, in addition, having the general duty of seeing that atomic energy was developed. It was necessary to have an authority to give final decisions on the competing claims for fissile materials; this called for the appointment of a senior cabinet minister with no departmental interest in the use of atomic energy. The Lord President was clearly the most suitable Minister, because he was responsible for science generally.

The amendment was negatived by 246 to 226.

An amendment moved by Mr. Beswick to provide that one member of the Authority should be appointed from among persons appearing to the Lord President of the Council to have had wide experience of, and shown capacity in, the organization of the workers, was agreed to.

Mr. A. M. F. Palmer moved an amendment to provide that one member of the Authority should be a person with wide experience in the supply and generation of electricity and that he should be appointed after consultation with the Minister of Fuel and Power. He said that the leading part that electricity supply would play in the utilization of nuclear energy should be recognized in the Statute, at the highest level. The amendment also proposed that the Minister, in making the appointment, should consult with the Minister of Fuel and Power. It might even be a dual appointment between the British Electricity Authority and the new Atomic Energy Authority.

Apparently there were differences of opinion in this country, even among the experts, on the timing of the development of electrical power supply from nuclear energy. The outlook in the White Paper was extraordinarily cautious. But progress in electrical application was a pressing urgency, and that strengthened the case for the amendment. Expert opinion seemed to be that atomic energy could redress the power shortage in this country in 10 or 15 years. That was his impression after summing up the expert evidence. As the price of nuclear energy came down it was likely that the price of energy developed by conventional methods would go up. It could not be doubted that the use of nuclear energy for the peaceful production of electric power was certainly one of primary interest.

Mr. Nabarro, opposing the amendment, said it was obvious that within a few years electricity would be the principal source of revenue for the authority. He was one of those who believed that it was a bad plan to put one's customer on the board of one's company.

Mr. Beswick said that the amendment did not necessarily mean that a member of the B.E.A. was to be a member of the new Authority. The Opposition considered that a person of knowledge and experience of the electrical generating industry would bring a very useful mind to bear on the deliberations of the Authority.

Sir David Eccles said that it was proposed—he thought the invitations had already gone out—that the B.E.A. should send teams of engineers to work with the industrial groups at Calder Hall and Risley. The important point was that reactor technology should be studied by those people who, under the arrangements already made with the B.E.A., were to design, construct and operate reactors if Dounreay was to be a success. It seemed that the best thing which the Authority could do was to invite experts from the electricity authorities to come now. It was necessary to associate, as soon as possible, those electricity experts with this particular section of the Authority's work, and the Government was determined to do that. The same would be done with the medical profession and branches of industry, which would also have opportunities to learn about those processes which might be of interest to their particular form of production. He really did not think that it would be wise to single out the electricity industry and increase the membership of the new Authority by the addition of a person having a special knowledge of that industry.

Mr. Palmer said that the answer was not satisfactory, but he would not press the amendment which was, by leave, withdrawn.

Dounreay Atomic Station

Replying to Mr. Grimond, Sir David Eccles said it was expected that the peak labour force for construction at Dounreay would approach 2,000 men, of whom over half would be unskilled. When running the plant would employ about 300 locally recruited workers, all unskilled or semi-skilled. The nature of the operations made it unlikely that there would be part-time or seasonal employment. Sir David informed Mr. Nabarro that the construction of the Dounreay plant was expected to take four to five years. It was too early, because of developments which might be incorporated in the design, to give a definite figure of cost, but it might be of the order of £15 million; for the same reasons he could not estimate the output of electricity. The suggestion of a model would be borne in mind but for this further study of plans was needed.

Bankside Power Station

Sir Herbert Williams asked the Minister of Housing and Local Government if he would publish the technical report which led his department to approve the construction of Bankside power station, subject to the condition that it should be oil burning.

Mr. Marples, who replied, said that technical advice given before the Bankside power station project was approved had already been made public. It was to the effect that sulphur and other noxious fumes could be eliminated, but that experiments with a pilot plant should first be carried out to determine the best method. That was done and a gas washing plant designed in the light of those experiments had been installed in the power station.

A Lancashire Project

Mr. Fletcher-Cooke asked the Minister of Fuel and Power if he would institute a public inquiry into the proposal of the British Electricity Authority to carry a line of 136 supergrid pylons through the village of Egerton, Lancashire, and up the Belmont Valley.

Mr. Joynson-Hicks said that the B.E.A. had as yet made no application to the Minister in this case, so the question of his instituting a public inquiry had not arisen.

Glasgow Supply Failure

Mr. Carmichael asked the Minister of Labour if he would make a statement on the number of man-hours lost to industrial production during the week ended 6th March when the Dalmarnock electricity power station was unable to supply light and power to the greater part of Glasgow.

Sir Walter Monckton said that precise information was not available, but the total number of workpeople who lost some working time as a result of the interruption of the electricity supply from the Dalmarnock power station during the week in question was in the region of 30,000. Some lost only one day's work while others lost two or three days.

Marine Electrical Engineers

Training and Responsibilities

A DISCUSSION on the training and responsibilities of marine electrical engineers was opened before the Utilization Section of the Institution of Electrical Engineers on 18th March by Mr. G. O. Watson (Lloyds Register of Shipping).

Mr. Watson had two main objects: to provide better trained electrical technicians in the lower grades with opportunities for promotion; and electrical engineers of professional status to fill the highest posts. He referred to unsuccessful attempts from 1920 onwards to induce the Board of Trade and subsequently the Ministry of Transport to obtain Parliamentary sanction to the issue of Statutory Certificates. The Departmental attitude was that seagoing (certificated) engineers were competent to deal with any emergency and that vital electrical services were duplicated; in any case only a voluntary basis would be considered. Shipowners appeared to be satisfied with the type of candidate they were getting.

The majority of entrants now were technicians with little training in technology. Many would probably pursue their studies at sea if given a target of a certificate based on a course of technology with apprenticeship and seagoing experience. The course might be that of the City and Guilds Electrical Installation Work, Course B, but substituting the I.E.E. Ship Regulations for the Building Regulations. For larger installations Ordinary or Higher National Certificate standard would be necessary. Electrical engineers should be enabled to qualify for M.o.T. certificates for competency as engineers. Watch-keeping as electricians should be recognized as qualifying as well as apprenticeship in an appropriate electrical factory. The ultimate aim should be towards having more men with an A.M.I.E.E. qualification in senior positions in large passenger liners and that all electrical superintendents ashore should be required to possess that qualification. Examples were cited of practice in several other countries which led to obtaining an equivalent of the engineer's certificate.

Status of Senior Electricians

Mr. J. B. Peacock (Alfred Holt & Co.) said that 20 per cent of senior electricians had resigned from his company in each of the past few years. With a complete turnover of senior electricians every five years efficient maintenance and continuity of thought and action were difficult to ensure. The average age of the 70 senior electricians employed was 33, that being the age at which they were lost to marine service after holding the position for an average of four years. The main reason for resignations was domestic ties, but others reasons were lack of status and of avenues of promotion.

Mr. F. J. Colville (Ministry of Transport and Civil Aviation) stated that deficiencies in the care and upkeep of electrical machinery did not affect the safety of ships so that there had been no interference with private enterprise. Could not the shipowners and the Institution, which had sufficient status to introduce its own certificates of competency, reach voluntary agreement?

Mr. D. S. Tennant (Navigators' and Engineer Officers' Union) expressed the view of his Union that the introduction of certificates for electrical engineer officers was overdue. The law would not necessarily be amended to make it compulsory to carry certificated electricians. To-day, the electrician could prove his competency only by long service with one company. A highly qualified electrical engineer officer had to leave his own profession and serve on the main engines before he could get a certificate, which was as a marine engineer officer.

Mr. A. Logan (Institute of Marine Engineers) giving his personal views as an engineer superintendent, emphasized that a chief engineer, in addition to electrical knowledge, must have experience with turbines and auxiliaries. An electrician as such could not become a marine engineer unless he had served an apprenticeship with a firm which also manufactured the main driving units and had passed the necessary examinations. Only one man should be responsible to the ship's master for the propulsion machinery, and that was the man holding the first-class marine engineer's certificate of competency. At the end of the last war his company, owning 21 turbo-electric ships, had decided against carrying electricians, which experience had shown to be right.

Commander (L) J. C. Turnbull, R.N., referred to the need for men in the higher ranks to be capable of understanding the design of equipment and of dealing on equal terms with designers. If not, shipowners would not get the best equipment and would lag behind those of other countries.

Qualifications Required

Mr. G. W. Canter did not agree that certificated electrical engineers were necessary in the merchant navy. The electrical industry had advanced the view that electrical plant had added little to complexity, and higher electrical qualifications would not necessarily provide opportunities for advancement except to the limited number of posts available ashore. Electronics were finding greater use in ships, but should not the maintenance of this apparatus be the duty of the radio engineer? Mr. Canter thought the term "electrician" should be replaced by a term for an engineer of second certificate level, with an electrical endorsement. It was not in the interest of the electrical industry to press for separate recognition of an electrical branch of the merchant navy, for that would deceive entrants into thinking that it offered career prospects equal to the best ashore.

Mr. S. Hogg (Ministry of Transport and Civil Aviation), in a written contribution, described the public pressure brought to bear on Parliament 100 years ago when there was no certificate of competency for marine engineers and accidents to machinery caused loss of life and property. He knew of no circumstances which would lead to similar pressure on Parliament for legislation to compel the employment of certificated electricians.

Mr. M. P. Holdsworth feared that certification of the seagoing electrician would widen the breach between the latter and the marine engineer. The presence of electrical engineers as specialists might remove the urge from other engineers to make themselves masters of the power on which they depended. In ships where the complexity of the installation required full-time employment for more than one man, companies might engage a good class

of electrician with a full electrical apprenticeship and as high a paper qualification as possible as junior engineers (E).

Mr. L. Baker favoured certification but was not sure that it should be for an electrical officer *per se*. That would result in departmentalization. The existing second class regulations could be broadened to admit electrical engineers. The shipping industry should set about getting the right kind of intake as it did with the marine engineer cadetship.

Mr. H. E. Dance pointed out that the electrical content of the two-year diploma course was barely sufficient for any man who came into contact with any branch of electrical engineering.

Mr. P. Alcock said a number of ex-seagoing electricians applied for quite menial jobs ashore. They must give more prestige and progress to young men keen on electrical engineering and the sea. The suggestion that such a man, if very good, might become a third engineer, was almost an insult. Anyone who had seen merchant ships come into the yards after a period at sea, and was still satisfied with the state of the electrical equipment, was easily satisfied.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Overloaded Systems

I REMEMBER reading in your journal some little time ago a paragraph in which you commended one of the Electricity Boards for the action they had taken in preventing the local authority from converting their houses from electric cooking to gas cooking. As far as I can remember, the reasons why the local authority wished to carry out this conversion were not given.

I am living in an area where I am entirely dependent on electric cooking. I have been in my present house for not quite twelve months, and during that time there have been at least twelve breakdowns in supply, generally about midday on Sunday. The most serious one occurred at the same time on Christmas Day. The duration of the breakdowns varies from between two and five hours.

While my wife prefers electric cooking, she realizes that the first essential on any type of " power " supply of cooking is reliability, and so far as the electricity supply is concerned in my area, I think you will agree the foregoing remarks prove that it is quite unreliable. My wife would willingly forgo her preference for electric cooking and change over to gas cooking because of its greater reliability.

I have corresponded with the electricity supply authorities who are always about to take action. The most recent breakdown occurred last Sunday, 14th March.

I wonder what comments you would pass if the local authority here was in a position to change over from electric cooking to gas cooking?

Culcheth, Lancs. L. R. IMRIE.

[Such breakdowns are the inevitable result of the overloading of systems which the Electricity Boards have been unable to reinforce because of restrictions on expenditure. Much is now being done to remedy any shortcomings. Indeed Mr. Imrie has since sent us a note saying that he has heard from his District Engineer that an additional transformer has been put into service in his district which will end the breakdown trouble.—Editors, *Electrical Review*.]

Electromagnetic Theory

I SHOULD like to associate myself with Dr. L. E. C. Hughes in his protest against the use of magnetic poles as the basis of electromagnetic theory. In the unrationalized C.G.S. system, 4π lines of magnetic flux are assumed to emanate from a unit north pole. It is also one of the fundamental conceptions of magnetism that lines of magnetic flux form a closed circuit. Consequently, the 4π lines of flux emanating from a unit north pole must complete their paths by returning to and through that unit pole, so that the net flux from the unit pole must be zero! Is it little wonder that there is so much confusion of thought on magnetic problems?

I am also very glad that Dr. Hughes has referred to the puzzle of self-demagnetization. It is astonishing that so many people persist in clinging to an absurdity that was exploded by Evershed over 30 years ago.

Hove. EDWARD HUGHES, D.Sc., M.I.E.E.

" Expensive Metering "

THE opinions on metering expressed by Professor Rawcliffe and quoted by you from his letter to *The Times* are open to criticism and I am sorry to learn from your editorial of 5th March that you believe our present metering methods are costly and wasteful. Such comments are all too easy to make.

The inference gained is that by replacing the present meter by something cheap and nasty and by widening the limits of accuracy the price of electricity would be reduced. I feel sure that upon reflection you will agree that this is hard to believe.

Having been associated with meters for 35 years I feel entitled to speak frankly and to say that if all sections of the supply industry were as well organized as the meter repair and test sections then savings could be made.

Professor Rawcliffe's criticisms would be more acceptable had they been accompanied by proposals and not merely views. I am sure that if he had consulted with experts in meter production before stating his views he would have discovered how much could be omitted from the present " commercial grade " meters (in finish or refinements) and the consequent reduction in cost. I venture to suggest the saving would be in coppers only.

The price of meters, as of other equipment, must obviously be a matter of constant concern to the Electricity Boards. I feel that it could be reduced, but not by encouraging a so-called " Utility domestic meter stable over long periods, etc.," with Boards purchasing each individual version of it from a dozen manufacturers.

The only way to bring about a substantial reduction in the price of domestic meters is either for Boards to purchase from a very limited number of manufacturers who would be offered a good " load factor "; or to develop a standard domestic meter, inviting prices for very large quantities.

The Electricity Supply (Meters) Act has served a very

excellent purpose. If it has now become a financial burden it might well be reviewed and revised provided that the saving would be effective.

Certain makes of our present "commercial grade" meters have a very long and accurate life on a 15-year change cycle and I dread the thought of the re-introduction of examples of so-called "cheap" meters. The supply industry should first try to economize in its most costly items.

"LOGICAL."

Meter *v.* Consumer

WITH regard to the correspondence on this subject, may I, as a consumer, relate my experience. Recently my meter (d.c.) had to be changed. I said to the fitter, "The new meter reads 130," and he replied, "Yes, it has been on test."

But when my account came in, it had been assumed that the meter started at zero and I was charged 130 units which I had not used.

Of course, I easily got this rectified, but what would have happened if I had not been in possession of the facts?

Margate. J. I. HUNTER.

Contract Information

AS regular subscribers to your esteemed paper for quite a number of years, we would like to raise a point which may be of interest.

We closely study your "Contract Information" section ("Work in Prospect") and have written hundreds of applications. We would point out that we do not offer our services indiscriminately but only when we feel that the size and kind of contract would be right for us. We are sorry to say that we have received an acknowledgment only two or three times in all. It may be possible that we have the wrong approach (quite frankly we do not really believe this) and we would like to know whether other contractors have had the same sad experience.

Also we wonder whether you could possibly induce firms to give applicants for contracts at least a rough idea when the contract may materialize. We would say that we have had this experience whether the contract is in the hands of a firm of architects or made known by the company which is having the work done.

At present we feel that we are wasting a considerable amount of time, labour and money.

*Willesden, N.W.*10. MOTT & REYNOLDS, LTD.
F. H. REYNOLDS, *Director*.

Costs of Metering

A précis of a discussion meeting on "The Influence of Legislation on the Costs of Metering," opened by Mr. S. Howarth at a meeting of the I.E.E. Measurements Section on 1st December last was circulated by the Institution. In this there occurred the following passage:

> "It was said that the average quarterly domestic bill for electricity was about £2 and cost 7s 6d to collect, owing to legislation originating in 1899 when a supply of electricity was so expensive that such incidental costs were less conspicuous."

The Institution now states that a more accurate rendering is:

> "It was said, on the question of accuracy of metering, that the legislation originated in 1899, when a supply of electricity was so expensive that costs attributable to these requirements were comparatively inconspicuous. It was remarked that the average quarterly domestic bill for electricity was about £2, and cost 7s 6d to collect."

This subject has been discussed in our "Letters to the Editor" section recently.

SERVO-MECHANISMS

Discussion on I.E.E. Paper

THE discussion which followed the presentation last week before the Measurements Section of the Institution of Electrical Engineers of two papers dealing with the performance of servo-mechanisms by Dr. J. H. Westcott and by Dr. J. C. West and Mr. P. N. Nikiforuk (see *Electrical Review*, 19th March) was opened by Professor C. Holt Smith (Military College of Science). He criticized Dr. Westcott's approach to the subject and his argument that, with a step function, an initial large error made an excessive contribution to the integral of error squared. The basic problem was to find a criterion which reduced the contribution to the total error of that initial error. Time-weighting was one arbitrary way but would not be easy to extrapolate to other waveforms. As alternatives modulus of error, root modulus of error or, in the limit, total time for which the error exceeded some predetermined value all reduced the relative contribution of the larger errors. Whether they led to a better design still required investigation.

Mr. R. H. Macmillan (University of Cambridge) expressed doubt about the minimum criteria based on an arbitrary step input. More investigation of criteria based on a random input was required, because sudden steps did not normally occur. He wondered whether the time-weighted criterion was any more simple to calculate when input was not a specialized function.

Mr. P. H. Hammond (R.R.E., Great Malvern) illustrated a construction for predicting the jump phenomena as presenting slight advantages over the authors' construction. His assumptions were similar to the authors', namely, that harmonics generated in non-linear elements were effectively smoothed out by the subsequent linear element which usually contained inertias.

Non-Linear Systems

Mr. Grensted (University of Cambridge) referred to the considerable amount of theoretical work on non-linear feedback control systems which had been done at the University over the past year, in which the harmonics generated by the non-linear element had been neglected, as had been done by the authors. That method, if applied with caution, gave correct results for the degree of stability of non-linear systems. The amplitude and frequency of self-excited oscillations could be predicted to within about 10 per cent accuracy. The authors had applied the method to a system which was excited externally by a signal applied to the input, and their experiments verified the possibility of predicting the behaviour of the system if the harmonics generated by the non-linear element were neglected.

If a non-linear characteristic might be considered as the sum of other non-linear characteristics, then the describing function for the original characteristic was the sum of the describing functions of its component characteristics. That would simplify the computation of both output and gain describing functions.

Mr. J. F. Coales (chairman) said the large size of the transient response due to inertia was not the essential feature of a servo system or a control system. It was rather the reverse, because in a really good system there should be no large steps of input.

Mr. J. P. Corbett suggested that it was neither necessary nor desirable to have one criterion only. For high performance servo-mechanisms the criterion described might be desirable, but with some industrial control systems simpler criteria would be easier to apply.

Mr. J. K. Lubbock felt that the method proposed for synthesis by Dr. Westcott was not used in practice, mainly owing to the labour involved. One big advantage of sine-wave synthesis was that the effect of certain changes in the system could be readily seen.

Messrs. R. C. Steel, G. Ellesworth and J. J. Thompson also contributed to the discussion.

B.R.A. LUNCHEON

Presentation to Mr. E. G. Batt

MR. R. H. HEMMINGS, chairman of the Council, presided at the annual luncheon of the British Refrigeration Association at the Connaught Rooms, London, last Friday. Lord Mancroft was the chief guest and proposed the toast of the Association in a very competent and amusing manner. He praised the refrigerating machinery makers for their substantial contribution to the country's export trade which was vital to pay for our imported food. It was imperative that overseas customers should be offered what they wanted, when they wanted it and at the right price. The right price was not necessarily the lowest price; those customers were willing to pay a little more for British quality. They did expect firm delivery promises, however, and would not accept excuses for failure to provide goods on time. British manufacturers need not fear competition if they made the best and maintained good service. Lord Mancroft drew attention to the almost limitless markets for British goods in the Middle East.

Mr. E. G. Batt, in responding to the toast, said that this would be his last appearance as director and secretary of the Association. He was glad to report that business during 1953 (including exports) had recovered after the serious decline in the preceding year.

Although the scope for refrigeration was immense the competition now experienced necessitated great efforts. The best results could be achieved only by co-operative action, research and standardization on the part of producers. It was a pity that critics of trade associations did not better inform themselves of what was achieved by such bodies. The choice was between co-operation and cut-throat competition resulting in poor quality and bad effects upon the wages and lives of our people.

One of the refrigeration industry's greatest future problems would be the lack of trained men. Insufficient numbers of students were being nominated for the National College and he urged the industry to do better. An effort was to be made to start collective research at the College. This would be developmental rather than fundamental and the B.R.A. Council had assumed the responsibility of finding the necessary funds for the next two years.

After a reference to standardization proposals, Mr. Batt expressed disappointment at the Chancellor of the Exchequer's announcement that there would be no further reductions in purchase tax in the forthcoming Budget, although in the future they might be made at any time. That raised the question of tax-paid stocks in retailers' hands. The "sale-or-return" system was no answer to the problem and it should not be forced on industry against its better judgment. With seven other associations the B.R.A. had submitted what was believed to be a "watertight" scheme which would protect the retailer against loss when tax was reduced. So far the Chancellor had made no decision in the matter.

Because of the purchase tax situation they had hitherto been unable to supply home freezers to the home market. New arrangements had been made with the Customs & Excise authorities whereby this equipment could be sold for domestic use, although for the time being purchase tax applied to all such sales.

Referring to the unsatisfactory sheet steel position, Mr. Batt said that while there was a shortage and steel makers were refusing to accept orders for forward delivery, the very material they required was being exported to the Continent probably to be made into completed articles competing with our own. The alternative of buying sheet steel from the Continent or the United States was costly and unsatisfactory. Nevertheless Mr. Batt concluded on a note of confidence in the future of the British refrigeration industry.

The health of the chairman was proposed by Mr. N. F. T. Saunders (member of Council) who said that in view of the immediate difficulties which would arise from Mr. Batt's retirement and the appointment of his successor Mr. Hemmings had agreed to serve as chairman for a further year to see the Association through the change-over period.

After thanking Mr. Saunders for his remarks, the chairman on behalf of the Association expressed their thanks to Mr. Batt for his invaluable services during the past seven years and presented him with a television set and some antique silver.

ANNUAL REPORT

THE Association's report for the past year shows that the membership comprised 16 machinery manufacturers, 31 cabinet and cold store manufacturers, 162 distributors, 18 associates and one affiliate—a total of 228. During the year the Council held seven meetings and the Finance and Advisory Committee four.

Five member companies were responsible for a comprehensive exhibit at the British Electrical Power Convention, Torquay, in June last year. Activity in the affairs of the British Standards Institution continued and this work was kept under constant review by the Council and Technical Committee. It is expected that the following specifications will be issued within the next month or so:—"Manufacture and Testing of Refrigerating Cabinets of the 'Reach-in' Type, including Refrigerating Equipment," and "Manufacture and Testing of Sectional Cold Rooms of the 'Walk-in' Type, including Refrigerating Equipment."

Specific action has been taken by the Council with Government Departments and the suppliers of copper, brass and zinc; nickel; steel of all classes; and stipple glaze.

The Association has continued to support the work of the National College for Heating, Ventilating, Refrigeration and Fan Engineering, London, and the Stow College School of Engineering, Glasgow, including the presentation of technical books as prizes.

Close collaboration has been maintained with the British Electricity Authority and Area Boards on domestic and commercial refrigeration. The Council has continued to press the Chancellor of the Exchequer for the reduction of purchase tax on domestic refrigerators and food freezers. In conjunction with other associations a scheme was presented to the Chancellor in connection with rebate on tax-paid stocks. As a result of action taken by the Association arrangements were made by which domestic food freezers became available in the home market last July.

Under the heading "Frozen Food Containers," mention is made of a meeting in London last October, under the auspices of the International Organization for Standardization, which the director and secretary (Mr. E. G. Batt) and Mr. J. A. Stonebanks (Frigidaire) attended.

Government Departments have continued to consult the Association in connection with all important matters affecting the industry and during the year consultations have taken place with a number of bodies interested in refrigeration.

INDUSTRIAL NEWS

Engineering Workers' Wages

REPRESENTATIVES of the Confederation of Shipbuilding and Engineering Unions met the engineering employers last week to discuss the question of a wage increase. The unions claimed a rise of 15 per cent but a Court of Inquiry which investigated the position recommended that an increase of 5 per cent should be adopted as a basis for discussion. At the meeting the unions rejected an offer of 5 per cent and later the general secretary of the Confederation said that they would have continued discussion if something more than the bare 5 per cent had been proposed by the employers.

A meeting of the executive of the affiliated unions was to be held this week to consider the next move.

Electricians' Wage Claim

No agreement was reached at the meetings of the National Joint Industrial Council for the Electrical Contracting Industry which followed the resumption of work by electricians who had been on strike. The general secretary of the Electrical Trades Union stated last week that the dispute had been reported to the Minister of Labour with a request that it should be considered at an early meeting of the Industrial Disputes Tribunal.

It will be recalled that the dispute had already been reported to the Minister by the National Federated Electrical Association, but no action was taken because of the continuance of the strikes called by the E.T.U.

Electrical Engineers' Exhibition

Mr. P. A. Thorogood, the general manager of the Electrical Engineers' Exhibition held at Earls Court last week, tells us that the attendance totalled nearly 28,000—about double last year's number. Representatives of 23 countries (including Russia) visited the exhibition.

Contract Price Formulæ

The British Electrical and Allied Manufacturers' Association has issued the figures for its contract price adjustment formulæ. In each case the rate of pay for adult male labour at 13th March is deemed to be 141s 6d. The "cost of material" figures are:—

For electrical machinery and equipment the Board of Trade index figure published on 13th March is 155·1.

For turbo-generating and allied plant: materials used in mechanical engineering industries, 146·3, blast furnaces and iron and steel smelting and rolling (40 and 41), 142·9, price of $\frac{3}{4}$in o/d 18 s.w.g. brass condenser tubes (*Metal Bulletin*, 12th March), 3s $5\frac{5}{8}$d per lb. Outstanding contracts covered by the B.O.T. intermediate products index: the index figure for intermediate products (13th March) is 349·7.

Management Conference

The proceedings at the annual conference of the British Institute of Management, held at Harrogate last year, have now been published in book form. The book is obtainable from the Institute, Management House, 8, Hill Street, London, W.1, price 7s 6d.

Film Shows

Members of the Association of Supervising Electrical Engineers have been invited by the American Embassy to attend film shows at 6.30 p.m. on 6th April and 4th May. Tickets for the shows, at the cinema of the U.S. Information Service, 5, Grosvenor Square, London, W.1, are obtainable from Mr. P. A. Thorogood, 35, Gibbs Green, Edgware, Middlesex.

Lead Development Association

Under the sponsorship of the leading Commonwealth producers of lead, the Lead Development Association has been formed as a non-profit earning body. The objects of the Association are to extend the knowledge of lead in its manifold uses and to foster appreciation of its services to mankind.

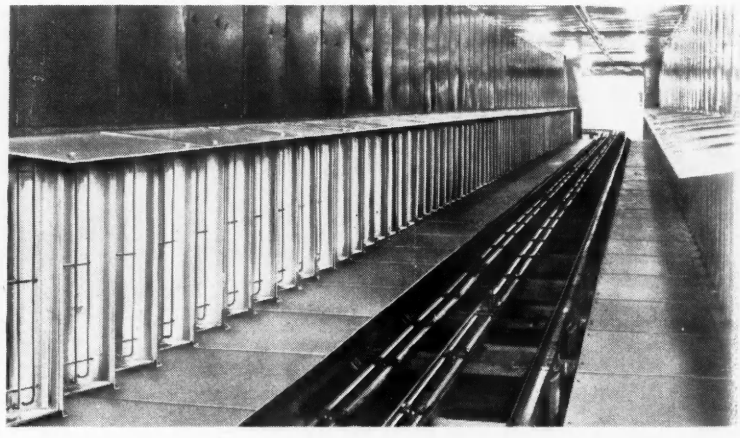
Hitherto, the only organization of its kind in the country giving information on lead matters has been the Lead Industries Development Council which confined its activities to those connected with lead sheet and lead pipe. With the formation of the Lead Development Association the Lead Industries Development Council will be known as the Lead Sheet and Pipe Council, and will become an associate member of the Lead Development Association. The offices of the Association and those of the Lead Sheet and Pipe Council are at Eagle House, Jermyn Street, London, S.W.1 (telephone: Whitehall 4175).

Two-Tone Automobile Finish

Two-tone stoving of synthetic paint on motor-car bodies has been, in the past, a very difficult problem for car manufacturers because of the need to avoid discoloration of the lighter colour on the top half of the body. Briggs Motor Bodies, Ltd., Dagenham, who are members of the Ford group, have overcome this difficulty for stoving the lower section of the new Ford luxury car, the Zodiac, by using "Metrovick" electric infra-red projectors.

The finish used on all Ford cars is a synthetic enamel which requires a stoving temperature of the order of 300 deg F. Attempts at ordinary convection stoving had resulted in the paint on the top half, already stoved, being heated again, and becoming discoloured. It was therefore decided to investigate the possibilities of localized radiant heat and the Metropolitan-Vickers Electrical Co., Ltd., built a pilot plant at its Trafford Park Works, Manchester, large enough to accommodate a complete Zodiac body on its trolley. Tests were satisfactory and the pilot plant formed the basis for the oven and heating arrangement in the production plant installed in a new paint shop specially constructed to deal with this stoving. The plant is "L" shaped in plan, and consists of a spray booth, flash-off section, stoving section and 6ft vestibules at each end. The overall length is 200ft with the actual radiant heating section occupying 120ft. Stoving time for each body is 15 minutes.

Two-tone stoving oven for Ford Zodiac bodies using "Metrovick" infra-red element projectors



The total installed load of the oven is 664 kW which is adjustable by means of energy regulators and contactors to a normal operating load of 400 kW. As a safety measure, the conveyor is interlocked with the banks of element projectors so that if the conveyor stops the radiant heat is automatically switched off.

Dunlop Brazilian Factory

The new Dunlop tyre factory in Brazil was officially opened on 20th March by Mr. G. E. Beharrell, managing director. The main electricity supply is brought to the factory from Taubaté substation, 12 km away, by an overhead transmission line which has been specially erected, and amongst the equipment supplied for it from the United Kingdom are four 1,500 kVA transformers, a large diesel driven stand-by generating set, and a 300 kVA mercury arc rectifier. The design of the factory has been drawn up in England to conform with Brazil's modern architectural outlook, and the construction has been carried through in record time by Brazilian contractors. In addition to the main production shop, the plant includes a modern textile mill, boiler house, substation, and a machine shop capable of carrying out major servicing and repair jobs on the spot.

West German Manufacture

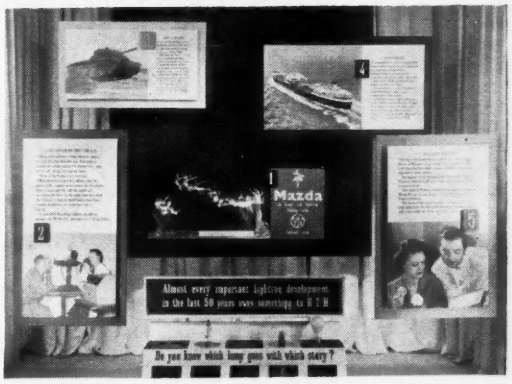
The total output of the electrical equipment industry of West Germany amounted last year to 6·75 milliard DM, an increase of some 650 million DM over the 1952 figure. This increase is ascribed in the first instance to higher demand for smaller items, especially domestic appliances. Transformer output increased but that of accumulators, generators and electric motors barely reached the 1952 level. The value of exports for 1953 is estimated at 1·25 milliard DM (1·05 milliard in 1952) a figure which is considered as very satisfactory bearing in mind the decline in prices and the much more severe competition in international markets.

Children's Cooking Competition

Twelve schoolchildren will compete in the final round of the children's electric cooking competition, organized by the Cornwall Sub-Area of the South Western Electricity Board, to be staged at the Faraday Hall, St. Austell, to-morrow (Saturday). Children from the age of twelve from schools all over Cornwall wished to take part in the competition and twenty-seven schools were used as centres for the eliminating rounds. The Faraday Hall will be equipped with six electric cookers arranged in cubicles and the competitors will draw lots to allocate the cookers. Tables will be arranged in the front of the hall where the children will prepare the food before cooking it in the oven. Points will be awarded not only for cooking results but also for the preparation of food, handling of equipment, neatness in working and the general appearance of the competitor.

"Quiz" Window Display

The "Mazda" FA.5 is one of the lamps displayed in the B.T.H. window at Crown House, Aldwych. The story of each lamp is told with illustrations on numbered boards, and the question "Which lamp goes with which story?" is answered by numbers, one below each lamp, that light up at intervals. The theme of the display is the one used in current Press advertising—"Almost every important lighting development in the last 50 years owes something to B.T.H." In addition to the "Mazda" FA.5, the lamps shown include those used in tanks and for flashlight photography. The display boards are framed in five colours.


1
Mazda
2
3
4
Almost every important lighting development in the last 50 years owes something to B.T.H.
Do you know which lamp goes with which story?

The latest display of the B.T.H. Company at Crown House, Aldwych, London

Canadian Phillips Company

Phillips Electrical Co. (1953), Ltd. (the Canadian affiliate of the B.I.C.C. Group), which was incorporated in Canada last year to take over the rod, wire and cable business of the former Phillips Electrical Works, Ltd., announces that, following a comprehensive survey of the present and potential market in Canada for electric wires and cables, it proposes to proceed with a programme for the expansion of the present production capacity; the manufacture of further products which would be suitable additions to the company's present range of products; and an increase in efficiency through improved facilities and layout.

To finance this programme Phillips Electrical Co. (1953), Ltd., is issuing a further $3 million of common stock of which $2 million will be taken up by British Insulated Callender's Cables, Ltd., and the balance of $1 million will be sold in Canada through W. C. Pittfield & Co., Ltd. When the additional financing programme is completed the capital structure will consist of $6 million in 5 per cent first mortgage sinking fund bonds; $3 million in 5½ per cent convertible sinking fund debentures; and $6 million in shares without nominal or par value, of which $5 million will be held by British Insulated Callender's Cables, Ltd. Mr. W. H. McFadzean, who is deputy chairman and chief executive of British Insulated Callender's Cables, Ltd., is also chairman of Phillips Electrical Co. (1953), Ltd.

Electric Blanket Fatality

A verdict of "Death by misadventure" was recorded by the Oswestry district coroner, Dr. W. B. A. Lewis, at an inquest at Oswestry on 16th March on Joseph Albert Perry (33), who was found dead in bed; an electric blanket had been left switched on.

Arthur Cyril Davies, of Gobowen, said that on 13th March he carried out tests on the blanket. A main switch controlled the light in the centre of the room. There was no electrical fault in the blanket, but if someone's body lay there with salt in perspiration, which was a good conductor of electricity, then it would be possible for the current to pass through the body as an alternative path to passing through the blanket. If the blanket was not fitted with a thermostat, it must be switched off. Police-Sergeant J. O'Reilly said Perry's clothing was saturated in perspiration. When he touched the body he received an electric shock.

Cookery Recipe Booklet

The Simplex Electric Co., Ltd., has issued a cookery recipe booklet, specially written for it by "Bon Viveur" (Phyllis and John Cradock).

"Same-Day" Motor Service

Designed to provide the speediest possible deliveries Lancashire Dynamo & Crypto, Ltd., has introduced a "same-day service" for standard voltage a.c. motors of from ⅛ to 100 h.p. The scheme, which is backed by a stock of 3,000 motors built up after an extensive survey of customers' requirements, means that all orders received before mid-day are despatched the same day. The motors include screen protected, "T.E. Fankuld" and units to British Standard dimensions.

Germanium Production in Japan

Recent investigations have shown that germanium can be obtained easily and in quantity from lignite mined in the north-western part of Shikoku, Japan, where total deposits of germanium-containing lignite are estimated at about 2,500,000 tons. A firm recently established with a capital of 50 million yen is erecting a works near Tokyo to process some 400 tons of

Shikoku lignite to produce 2 kg of germanium oxide per month, production to start this spring. It is proposed to install electrolytic equipment soon for the production of germanium metal.

Plant for Steelworks

The General Electric Co., Ltd., has received an order for a 2,500 kW back-pressure geared turbo-alternator set for the Margam Works of the Steel Company of Wales, Ltd. The turbine is to operate under steam conditions of 600 lb pressure 800 deg F total temperature, with a back pressure of 165 lb. The alternator will generate at 11 kV three-phase 50 c/s. McLellan & Partners are the consultants for the Steel Company.

"Living Electrically"

The April issue of *Good Housekeeping* published on 25th March contains a special supplement entitled "Living Electrically." This describes the use of electricity in the kitchen, for cleaning, heating and hot water, etc. Dame Caroline Haslett has contributed a foreword.

Royal Engineers' Association

The Royal Engineers' Association, London Group, is holding its second reunion of sappers and ex-sappers in Greater London, on 29th May, at the Duke of York's Headquarters, Chelsea, S.W.3. Music will be by the band of the Corps of Royal Engineers and there will be a cabaret. This occasion is for men only. Tickets (3s each) can be obtained from Mr. J. S. Pearson, hon. secretary, London Group, Room 31, Horse Guards, Whitehall, S.W.1.

Catalogues and Lists

Plessey Co., Ltd., Ilford, Essex.—Catalogue on the latest types of electrolytic capacitors (714).

Metway Electrical Industries, Ltd., King Street, Brighton.—Illustrated priced leaflet on porcelain ceiling roses, cleats, connectors, etc.

George Forrest & Son, Ltd., 30, Osborne Road, London, W.3.—Leaflet announcing price reductions of lighting fittings.

Anglo-American Vulcanized Fibre Co., Ltd., Bath Street, London, E.C.1.—36 page illustrated catalogue covering the company's range of "Delanco" electrical insulation materials.

A. E. Cawkell, 6–7, Victory Arcade, The Broadway, Southall, Middlesex.—Catalogue describing a range of "Cawkell" special purpose pulse equipment and oscilloscopes.

Oliver Pell Control, Ltd., Cambridge Row, Burrage Road, Woolwich, S.E.18.—Technical catalogue relating to "Varley" industrial solenoids.

Royce Electric Furnaces, Ltd., Sir Richard's Bridge, Walton-on-Thames, Surrey.—Technical catalogue dealing with high temperature furnaces.

Carter Gears, Ltd., Thornbury Road, Bradford.—Two leaflets dealing with "Carter" hydraulic infinitely variable speed gears.

R.P.R. Patents, Ltd., Alexandra Palace Station, London, N.10.—Illustrated brochure on the "Minchom Sempun" magnetic flaw detector.

British Thomson-Houston Co., Ltd., Rugby.—Descriptive technical leaflet on a range of selsyns (2751–1).

Trade Announcements

Mono Pumps, Ltd., has moved to Mono House, 1 Sekforde Street, London, E.C.1.

A new block of offices for **Duratube & Wire, Ltd.,** was formally opened at the company's Feltham factory on 19th March.

Barber Electrical Services, Ltd., Birmingham, announces that Mr. G. T. E. Cheney has joined its sales organization.

Brook Motors, Ltd., has moved its Newcastle-on-Tyne sales office to 35, Pink Lane. The telephone number is unchanged. The company has recently taken over another factory at Aspley, Huddersfield, with a floor area of nearly 20,000 sq ft for the manufacture of electrical stampings.

NEW B.T.H. PROJECTOR

A NEW 16 mm film projector with facilities for magnetic sound recording and reproduction, in addition to the conventional optical-sound system, is to be introduced by the British Thomson-Houston Co., Ltd., later this year. In appearance the machine is similar to model 401, with the additional controls and electronic equipment for magnetic sound housed in a plinth under the projector, the height being increased by 2½in and the weight by 5½ lb. There are no trailing cable connections between various units when recording or editing the magnetic-sound track, but an arrangement will possibly be incorporated to enable the equipment to be operated as two separate units.

Apart from the additional equipment required for recording and reproduction of magnetic sound, several other changes have been incorporated. To enable the equipment to reproduce high-quality sound at the silent speed of 16 frames per second a new sound-head with an instant-start high-speed flywheel has been introduced, enabling full advantage to be gained from the improved sound quality available by magnetic recording. The film take-up drive has also been replaced by a gravity-compensated mechanism in order that the film can be run in reverse for ease of editing a magnetic recording.

The facilities available include reproduction of an optical-sound track at 16 or 24 frames per second; recording and replay of magnetic sound at 16 or 24 f.p.s. on full, half, or edge-width track; reproduction from optical-sound and magnetic-sound tracks simultaneously; and recording from optical on to magnetic track on the same film with facilities for mixing inputs.

LIGHTING NOTES

SCHEMES for improved lighting submitted to the BELFAST POLICE Committee include one which provides for the replacement of gas lamps round the City Hall by vertical fluorescent lamps.

ELIE and EARLSFERRY Burgh Council, Fife, is applying to the Ministry of Transport for permission to convert the street lighting from gas to electricity.

BOOTLE Corporation proposes to improve the lighting of Orrell Road at a cost of £1,103.

SOUTHGATE Highways Committee has agreed to suggestions of the Ministry of Transport and Civil Aviation for improving the lighting of Green Dragon Lane (£3,100), Bramley Road (£3,400), Bush Hill (£625), Eversley Park Road (£1,400) and Cockfosters Road (£3,150).

WALLSEND Town Council has under consideration an estimate from the North Eastern Electricity Board amounting to £2,278 for improving the lighting on the Coast Road, using sodium vapour lamps.

STRETFORD Highways & Sewerage Committee recommends the installation at an estimated cost of £9,442, of improved street lighting in King's Road, Warwick Road North, Cornbrook Street, Shrewsbury Road, East Union Street, and Ayres Road during 1954–55 at an estimated cost of £9,442.

WEST HARTLEPOOL Town Council has applied for loan sanction for £33,036 for converting street lighting from gas to electricity.

The AYCLIFFE Development Corporation, Co. Durham, is to spend £7,000 on street lighting.

PETERBOROUGH City Council is to proceed with the installation of electricity for the use of stallholders in the Market-place.

HASWELL (Durham) Parish Council is to raise £1,600 for street lighting improvements which will be put in hand when the North Eastern Electricity Board takes over the network from the Coal Board.

WANDSWORTH Borough Council is recommended to approve a scheme, estimated to cost £1,412 for the erection of a further 24 street lamps at the Putney Vale housing estate.

The Parish Councils of MONK HESLEDEN, EASINGTON and HASWELL, Durham, are seeking loan sanction for £4,439, £4,500 and £4,600 respectively for proposed street lighting schemes.

ILKESTON General Works Committee has recommended that the 1954–55 street lighting improvement programme shall include conversions from gas to electricity in Darby Road, Ladywood Road, Wharncliffe Road, Lord Haddon Road and Manners Road (all Class "A" lighting) at a total estimated cost of £4,350, with Class "B" lighting in other roads at a cost of £650.

OVERSEAS ELECTRICAL TRADE

Increased Machinery Exports

EXPORTS of British electrical equipment showed a small, but welcome, improvement in February. Reversing the recent trend, the total value, at £13,444,880, was higher than a year ago, the figure for February, 1953, being £13,323,724. This was not, however, sufficient to make up for the lower level of trade in January, and the aggregate value for the two months was roughly 2 per cent below that for the corresponding period of last year.

While many of the individual items in Table I have fluctuated widely, in general the demand for electrical machinery during the first two months of the year remained good; against this there was an appreciable reduction in exports of cables and wires. Shipments of generating plant and motors rose in value from £4,877,188 in January–February, 1953, to £5,076,869 this year, the chief buyers being Australia, £793,275 (against £636,951), South Africa, £538,354 (£594,506) and India, £346,217 (£553,022). The reappearance of Russia as a large purchaser of plant of this description is noteworthy; in the first two months of the year she took £323,596 worth against £6,819 in the corresponding months of 1953. Large increases are also recorded for the Netherlands (£266,170 against £171,647), Portugal (£135,103 against £13,267) and the United States (£118,282 against £40,531). Exports of other types of heavy electrical machinery, such as convertors, rectifiers, transformers and switchgear, increased in value from £4,563,461 in January–February, 1953, to £4,769,276 this year, South Africa taking £1,004,895 (against £838,307) worth, while £157,981 (against £7,694) worth went to Portugal.

Reduced purchases by India (£544,884 against £1,305,200) and Australia (£191,760 against £742,819) were mainly responsible for the lower level of cable exports, though many other countries also bought less—in fact, 26 out of the 40 listed in the Board of Trade returns. Brazil, Mexico and Roumania made no purchases of this kind last month.

In the aggregate, exports of radio apparatus were well maintained, with a total value for the two months of £3,679,278 against £3,531,104, an increased demand for

TABLE I.—ELECTRICAL EXPORTS

Class	February, 1954	Two months ended 28th February	
		1953	1954
	£	£	£
Generating sets and generators:			
Diesel-driven, up to 10 kW...	69,209	191,790	187,685
Ditto, 10 to 65 kW	64,854	279,422	181,159
Ditto, 65 to 200 kW	46,209	260,594	97,397
Ditto, over 200 kW	191,839	224,411	534,987
Spark ignition engine driven	23,776	51,456	39,438
Steam turbine driven	2,756	131,156	9,567
Other prime mover driven...	64,817	79,525	162,486
Generators	274,023	631,622	480,912
Parts of generators	543,287	768,011	1,148,915
Motors, complete, other than railway, tramway and trolley-bus:			
Up to ½ h.p.	1 2,737	239,204	332,622
Over ½ h.p. but under 1 h.p.	45,486	71,480	87,684
1 h.p. to 250 h.p.	393,568	872,489	813,195
Over 250 h.p.	186,000	309,469	287,347
Railway, tramway and trolley-bus motors complete and parts of all motors... ...	118,959	294,670	301,277
Motor starting and controlling gear ...	193,478	471,889	412,198
Converting machinery	19,865	54,311	42,461
Mercury-arc rectifiers	46,214	122,949	130,219
Transformers for lighting, heating and power (incl. coils)	840,254	1,900,578	1,923,206
Switchgear and switchboards (not telegraph or telephone)	1,423,491	2,485,623	2,673,390
Primary batteries:			
Lighting	64,017	99,007	146,321
Radio	140,932	150,528	269,459
Other	44,542	99,636	89,794
Parts (excl. carbons)...	57,763	43,501	118,536
Lamps:			
Filament, exceeding 24 V	54,901	124,434	123,319
Ditto, under 24 V	25,251	35,370	67,315
Discharge lamps, fluorescent tubes, etc. ...	66,536	78,429	127,720
Other lamps	12,245	35,604	105,356
Radio and television, etc., apparatus:			
Cathode-ray tubes	9,662	13,334	17,551
Other valves (not X-ray)	139,718	324,133	281,617
Radio and television transmitters	92,574	131,247	119,485
Commercial radio and radar equipment ...	807,163	1,466,039	1,719,280
Domestic radio receivers, mains	109,430	411,514	269,716
Ditto, battery	40,872	81,386	95,371
Ditto, other (inc. car)	5,417	34,825	18,921
Radiograms	28,685	87,457	52,869
Television sets	1,353	7,083	6,693
Public address equipment	46,749	96,892	110,676
Sound reproducing app. n.e.s.	17,467	26,565	32,617
Components and parts n.e.s., incl. parts of valves and c.r. tubes	407,314	850,629	954,282
Telegraph and telephone installations ...	740,523	981,210	1,244,564
Telephone instruments, separately consigned	116,120	429,655	242,348
Telegraph and telephone parts	325,316	1,351,984	935,160
Line apparatus for long distance commun. ...	226,893	313,824	432,275
Cookers	47,972	104,970	98,536
Toasters	15,749	30,988	21,841
Other cooking apparatus	21,644	37,960	42,864
Parts and accessories	29,737	55,863	56,771
Space heating appliances	37,355	46,103	54,444
Water heating appliances	19,682	56,009	52,420
Other heating appliances	36,413	58,545	67,872
Parts and accessories	40,817	88,655	88,360
Irons	60,497	69,549	111,356
Arc welding equipment, a.c....	31,114	95,743	75,425
Ditto, d.c.	34,610	89,609	62,913
Resistance welding equipment	14,377	15,186	22,192
Magnetos, ignition	25,304	75,225	35,054
Sparking plugs...	129,857	252,030	298,333
Elec. appliances for aeroplanes, n.e.s. ...	353,156	181,247	522,887
Ditto, for motor vehicles, n.e.s.	220,236	395,582	426,968
Ditto, for cycles, n.e.s.	61,472	112,847	151,425
Signalling app. (incl. traffic signals)	57,944	123,431	112,037
Industrial radio-frequency equipment ...	19,070	29,988	44,613
Bell app. (not telegraphic or telephonic) ...	8,925	14,730	13,853
Instruments, commercial	132,853	250,783	300,189
House service meters (not prepayment) ...	98,135	148,519	206,852
Ditto, prepayment	8,707	22,437	20,058
Electro-medical apparatus (not X-ray) ...	41,560	67,468	86,656
X-ray apparatus (excl. tubes and valves) ...	36,303	172,477	85,365
Vacuum tube	13,358	47,403	39,750
Desk fans	19,804	65,225	48,142
Ceiling fans	75,009	214,710	181,826
Vacuum cleaners	200,124	261,819	390,082
Floor polishers	152,569	72,716	238,078
Food mixers	37,502	78,523	67,901
Hair clippers and dry shavers	76,970	61,091	102,592
Other portable appliances	30,157	39,636	52,488
Parts	83,810	92,882	145,683
Portable elec. tools (not saws) and parts ...	141,555	300,730	267,112
Cables and wires:			
Telegraph and telephone, submarine ...	2,207	89,036	99,382
Ditto, other	351,987	1,318,053	844,776
Cotton, silk or art. silk insulated	41,560	186,156	75,846
Enamel, glass or asbestos insulated	58,828	185,693	131,938
Paper insulated	449,916	2,406,335	1,241,197
Rubber insulated	315,943	999,664	682,585
Other	197,860	736,404	426,177
Accumulators for motor vehicles	158,726	278,302	295,112
Ditto, traction...	33,537	21,458	61,322
Ditto, radio and other portable	18,068	50,931	53,529
Ditto, other	29,739	97,390	108,824
Parts and accessories	52,220	113,149	110,959
Elec. porcelain, etc. (incl. in ulators) ...	100,519	201,821	198,489
Insulating cloth and tape	40,501	80,960	83,984
Other insulating material	68,609	107,620	147,734
Permanent magnets	45,739	85,055	72,453
Radio, telegraph and telephone testing equipment, n.e.s.	31,818	44,652	60,045
Scientific elec. instruments (not telegraphic or telephonic)	161,128	282,615	380,743
Electrical machinery, n.e.s.	68,539	174,129	190,827
Electrical apparatus and appliances, n.e.s. ...	510,824	1,145,204	1,133,792
TOTAL	13,444,880	29,130,241	28,420,242

TABLE II.—DISTRIBUTION OF ELECTRICAL MACHINERY, APPARATUS AND APPLIANCES

Country	February, 1954	Two months ended 28th February	
		1953	1954
	£	£	£
Channel Islands	40,023	87,868	99,999
Gibraltar	7,400	28,439	16,530
Malta and Gozo	39,532	26,641	106 016
Cyprus	66 017	72,253	143,661
Sierra Leone	12,881	37,131	23,454
Gold Coast	78,278	180,841	157,383
Nigeria	141,999	312,702	269,900
Union of South Africa	1,390,039	3,809,940	2,886,941
Northern Rhodesia	91,256	276,469	172,502
Southern Rhodesia	199,926	531,211	331,289
Tanganyika	40,333	85,071	80,033
Kenya	104,705	592,761	406,223
Uganda	156,747	91 187	248,494
Nyasaland	11,743	21,032	18,932
Mauritius	14,120	47,294	37,924
Aden	74,242	354,262	193,790
Bahrain, Qatar and Trucial Oman	67,959	146,940	160,210
Kuwait	145,519	272,934	364,378
India	872,349	3,408,917	2,559,878
Pakistan	448,860	510,688	1,172,721
Singapore	176,992	706,370	376,732
Federation of Malaya	164,410	564,391	348,348
Ceylon	88,205	264,065	215,615
British North Borneo	27,317	58,044	55,244
Hong Kong	105,653	414,902	258,018
Australia	1,775,430	3,378,948	3,027,651
New Zealand	675,916	1,558,102	1,402,912
Canada	587,832	998,371	1,008,612
Jamaica	37,253	94,926	132,340
Barbados	9,923	41,591	18,469
Trinidad	74,089	95,490	183,830
British Guiana	44,109	40,997	71,245
Anglo-Egyptian Sudan	57,238	177,246	177,788
Other Commonwealth countries	97,128	279,595	223,594
Irish Republic	230,262	737,267	513,586
Soviet Union	162,762	12,349	533,283
Finland	109,973	168,013	265,241
Sweden	270,403	517,975	541,927
Norway	268,655	492,102	491,933
Iceland	9,879	18,866	19,707
Denmark	237,621	152,719	443,944
Poland	62,203	245,977	253,245
Western Germany	103,205	136,991	202,653
Netherlands	472,879	766,676	942,717
Belgium	279,649	492,935	636,869
France	399,408	374,841	649,687
Switzerland	55,663	129,634	137,856
Portugal	380,395	177,562	602,02[illegible]
Spain	221,928	602,409	460,844
Italy	201,021	323,811	436,806
Austria	101,364	62,170	202,740
Czechoslovakia	389	20,692	8,157
Yugoslavia	54,518	192,540	125,294
Greece	52,733	171,789	105,830
Roumania	249	161,829	276
Turkey	95,668	316,604	159,674
Netherlands Antilles	5,502	43,782	12,127
Belgian Congo	18,282	75,581	43,380
French Morocco	29,558	47,913	52,100
Angola	8,079	37,995	27,829
Portuguese East Africa	21,020	48,245	48,258
Syria	26,023	42,920	38,074
Lebanon	36,103	64,339	63,226
Israel	46,889	37,513	82,274
Jordan	32,650	24,172	42,714
Egypt	124,594	244,092	210,438
Libya	16,429	39,363	20,976
Saudi Arabia	48,806	67,259	97,281
Iraq	228,501	396,358	552,043
Iran	25,381	41,629	52,522
Burma	83,009	136,088	236,325
Thailand	20,893	261,105	44,715
Indonesia	42,121	175,417	88,673
Japan	36,888	73.669	105,829
United States of America	230,021	329,439	493,787
Cuba	24,232	29,879	44,631
Mexico	8,216	52,691	36,162
Colombia	33,144	128,398	96,730
Venezuela	159,141	250,675	324,656
Peru	20,629	61,126	58,467
Chile	20,126	54,240	40,071
Brazil	132,412	187,569	198,093
Uruguay	40,988	43,534	108,580
Argentine Republic	67,529	22,308	219 333
Other foreign countries	161,464	269,572	296,001
TOTAL	13,444,880	29,130,241	28,420,242

the commercial types more than offsetting the reduced value of domestic receiver exports. Among smaller classes of goods in which British manufacturers have gained ground may be mentioned electrical appliances for aeroplanes, exports of which in January–February were worth more than three times as much as a year ago; appliances for motor vehicles and cycles; electric irons; and vacuum cleaners and floor polishers.

Table II analyses the total electrical exports in Table I according to destination. Not included in these tables are several types of electrical equipment classified under other headings, such as electrically operated washing machines and parts, exports of which rose from £572,785 in January–February, 1953, to £970,319 in the first two months of this year. Electric locomotives valued at £389,276 (against £418,723) and i.c. engine locomotives with electrical transmission valued at £384,659 (against £389,806) were also exported.

Imports of electrical machinery and apparatus in February amounted in value to £1,142,902, making the total for the first two months of the year £2,280,994 (against £1,377,384). The principal suppliers, with comparative values for the first two months of this year and last, were: Netherlands, £741,995 (£313,675); United States, £443,511 (£366,589); Canada, £207,959 (£39,593); Western Germany, £196,545 (£201,192); France, £136,144 (£59,918); Switzerland, £67,853 (£65,858); and Sweden, £61,273 (£44,621).

ELECTRICAL RESEARCH REPORTS

RECENT E.R.A. reports include Ref. J/T156, "Creep Properties of Steels Utilized in High Pressure and High Temperature Superheater and Steam Pipe Practice. Part III.—Revision of Long Time Creep Data for a Carbon Steel Header and a Carbon-Molybdenum Steel Pipe," by R. W. Ridley, B.Sc. (National Physical Laboratory), available at 10s 6d. In Parts I and II of this series of papers estimated temperatures for 0·1 to 0·5 per cent creep in periods up to 100,000 hr for three carbon and three carbon-molybdenum steels were given, over a selected range of stress, obtained by logarithmic extrapolation of creep tests of less than 10,000 hr duration.

The present report gives revised temperature estimates for one carbon superheater header at 5 tons/sq in and for one carbon-molybdenum steam pipe steel at 6 tons/sq in, based on the results of creep tests at these stresses lasting 67,000 hr. The extended tests indicate that modifications are necessary in the previously extrapolated temperatures corresponding to 100,000 hr. The two tests are being continued for the full time of 100,000 hr.

In Report Ref. W/T27, "*In Situ* Methods of Measuring Soil Moisture Content—A Critical Résumé," by B. A. Eastwell, B.Sc. (price 15s), a brief account is given of the need for a satisfactory method of determining under field conditions the quantity of moisture present. Methods already developed have been studied in detail and their relative advantages and disadvantages are discussed. The limitations of the tensiometer and the difficulties of calibrating satisfactorily all kinds of soil moisture units are explained and finally suggestions are made for further research on this problem.

Copies of these publications may be obtained from the British Electrical and Allied Industries Research Association, Thorncroft Manor, Dorking Road, Leatherhead, Surrey.

Batti-Wallahs' Society

THE increasing popularity of the Ladies' Night of the Batti-Wallahs' Society as one of the major electrical functions of the season was evident on Wednesday last week when a gathering of over 300 members and guests, who included well-known men from all branches of the electrical industry, were received by Mr. A. G. Freeborn, the president, and his daughter, Mrs. B. W. Downham.

It is an unwritten law at these gatherings that speeches shall be few and brief, and apart from the loyal toast, the only others were the toasts to the president and " Sweethearts and Wives." The first of these was proposed by Mr. J. W. Perkins, the immediate past-president, who in a witty speech paid a tribute to Mr. Freeborn for the manner in which he had carried out the duties of his office during the past year. He expressed the regret of all there at the absence, through ill-health, of Mrs. Freeborn, and said he was glad to know that she was now almost completely recovered.

Mr. Freeborn, in reply, said that the long list of distinguished men who had preceded him in the office of president made him appreciate all the more the honour which the Society had conferred upon him. He paid a tribute to the " Mate," Mr. T. C. F. Bigland, for the arrangements which had made the evening such a success.

Mr. P. V. Hunter, to whom was entrusted the toast to the ladies, was in excellent form, and Mrs. Tenison made an admirable response.

After the dinner there was dancing and a cabaret.

(1) Mr. A. G. Freeborn (president) and his daughter, Mrs. B. W. Downham (left), receive Mr. and Mrs. P. V. Hunter. (2) The president and his daughter greet Rear-Admiral (L) Sir Philip Clarke and Lady Clarke. (3) Mr. and Mrs. H. Bishop. (4) Mr. J. W. Perkins (past-president) proposes the health of the president. (5) Mrs. Tenison responds for the ladies. (6) Sir John and Lady Hacking. (7) Miss K. Aldridge, Mr. T. C. F. Bigland (the " Mate ") and Mrs. W. L. Martin

Government Research

Annual Report of the D.S.I.R.

A MORE cheerful note than has been apparent for some years is struck by the Advisory Council in the report for the year 1952–53 of the Department of Scientific and Industrial Research which has just been published as Cmd. 9083 by H.M. Stationery Office, price 8s.

The Council records satisfaction that a plan has been agreed for substantial growth of the D.S.I.R. over the next five years. This plan, it says, affords the Council firm ground on which to advise how best to allocate the resources it may expect to be made available and on which to base forward policy. However, the report quotes some examples of the difficulties owing to lack of resources in the past. In a note on the future at the end of the report the Council says that a specially welcome feature of the proposals for the next five years is the provision that a shortfall of expenditure in any year may, subject of course to the necessary funds being voted by Parliament, be made good in subsequent years. This will give the flexibility on which the Council has laid so much stress and the broad effect of the arrangements will be to bring the Department's post-war plans nearly to completion by 1959.

In the section on the National Physical Laboratory it is pointed out that a significant proportion of the effort of the Laboratory has continued to be devoted to work of direct or indirect importance to defence. Good progress has been made in the construction of buildings for housing new high subsonic and supersonic wind tunnels and in the Laboratory for work on ceramics, X-ray crystallography and the application of radioactive tracers to metallurgy.

Some years ago a temporary lecture hall was provided by the conversion of an old wind tunnel building. Information and scientific meetings are frequently held in it and a series of international symposia at the rate of two per annum has been started. It is indicated that one of these symposia each year will deal with a fairly fundamental scientific subject while the other will be primarily of industrial importance.

In the Electricity Division two items of work have reached an interesting stage. In May the original skeleton programme of standard frequency transmissions was replaced by a complete 24-hour service on 2·5, 5 and 10 Mc/s. The signals are modulated at regular intervals to provide a standard 1,000 c/s note and standard seconds pulses. The other work is concerned with insulating materials and comprises a survey of the basic dielectric properties of four representative classes of industrial materials, chiefly the newer plastics, and an examination of the relationship between the properties in electrical practice (low power factor and permittivity independent of frequency and temperature) and the economical structure of the material. This work provides the development engineer with some insight into the limitations of the materials at his disposal and the directions in which improvement is most likely to be obtained.

Other work described in the report which will be of interest to electrical engineers is that of the British Electrical and Allied Industries Research Association. This continues to be concerned with the generation of electrical energy, in its economical transmission and distribution, its most efficient utilization and the reliability of equipment. A substantial amount of fundamental research continues to be carried out.

On the generation side work has continued on the possibility of utilizing wind power and the development of the fuel cell for direct generation. The Association is also assisting the Ministry of Fuel and Power on possible electrical methods in preparing coal seams for gasification *in situ*.

Among a whole range of other research projects of electrical interest a study of large electric floor heating installations is providing energy consumption and temperature distribution data for single and multi-storey buildings. These figures are of particular interest in view of the peak load problem. A comparison between the response of two systems, one using buried water pipes and the other buried electric conductors, has also been made. It has, furthermore, been established that a dual purpose heat pump cooling a domestic larder and providing at least 500 gallons of hot water per week for one-third of the normal electricity consumption is a practical possibility. General heat pump investigations continue.

Mercury-Arc Rectifiers

CATHODE-SPOT behaviour and the thermal control of the emission zone in mercury-arc rectifiers formed the subject of a paper presented by Dr. H. von Bertele on 24th March before the Supply Section of the Institution of Electrical Engineers.

Between 80 and 90 per cent of the total valve volume, he stated, was required to deal with the mercury transferred from the pool cathode of power rectifiers, an accepted value being 5 mg/A sec. Such mass transfer was due partly to evaporation from the cathode surface, in so far as its temperature exceeded that of the container surface, and partly to independent high-speed vapour jets originating near the spots of emission (where temperatures were considerably above the average) thus causing splashing of the mercury. It was suggested that average surface and emission-area temperatures were exclusively determined by thermal resistance to heat dissipation from the emission area, which was conductive through the pool and convective in the discharge space.

Control of mass transfer had been mainly through "anchoring," i.e. the tendency of spot emission to affix itself to metal parts protruding from the pool. Anchored emission appeared as a bright line at the wetting edge between the mercury and the anchor. A strip anchor (for which the only suitable metal was molybdenum) gave best heat dissipation when about 1 mm in width and placed at 5 mm deep and bonded to the pool bottom. In practice the resistance was about 10 deg C/W-cm, making an anchor-zone temperature of at least 225 deg C. The development of low heat resistance anchors was described.

Anchoring alone could not suffice for the control of mass transference, as it determined the place of emission but not its phase of operation. The suppression of mass transfer was equivalent to the selection of specific phases of emission and could be achieved by a suitable design of cathode. The exploitation of patch emission on condensing films would reduce the mercury pool to a small reservoir sufficient to maintain the films. By such means of control, the useful range of vapour discharge devices was expected to be greatly widened.

C.D. in Electricity Supply

DRAFT regulations have been prepared by the Ministry of Fuel and Power, under Section 6 of the Civil Defence Act, 1948, empowering the Minister to make grants to the British Electricity Authority and Electricity Boards towards approved expenses incurred in securing the due functioning of their undertakings in the event of hostile attack. They also provide that the B.E.A. and Boards shall furnish to the Minister such information as he may require as to the measures they have taken, and that they shall take such measures as he may specify to secure the due functioning of their undertakings. Copies of the draft regulations, the Civil Defence (Electricity Undertakings) Regulations, 1954, may be obtained from H.M. Stationery Office, price 3d.

Overhead Lines Across Estates

Billingham-on-Tees U.D.C. has withdrawn its opposition to the erection of overhead electric lines on housing estates. The North Eastern Electricity Board reported to the Council that in the past five years there had been only five cases where overhead lines on housing estates had broken and fallen and in no case had personal injury resulted. The Council had based its opposition to overhead lines on housing estates on the fear that the lines might collapse and cause injury to people living nearby.

Electricity Boards' Sales

The accompanying table analyses the sales of Electricity Boards during February. The national figures show an increase over February, 1953, of 13·6 per cent, but when corrected for weather and the number of effective working days the increase is 9·4 per cent. The weather conditions were considerably colder than a year earlier but there were the same number of working days in February, 1953.

Distribution Extensions

The following proposals submitted by the North Eastern Electricity Board have been approved by the Durham County Planning Committee: L.v. overhead lines to supply Little Stainton near Darlington, Aislaby near Yarm, and 115 properties at Marley Hill; a 20 kV overhead line in connection with the transfer of the network at Blackhall Colliery from the N.C.B. to the Electricity Board's system; a 20 kV line for the provision of a supply to 529 houses and other properties at West Simonside, South Shields; a 20 kV overhead line and reconstruction of existing l.v. network at Witton Gilbert; l.v. overhead line and reconstruction of existing network at South Hetton; erection of a 20 kV line for the supply to 86 houses at Evenwood; and a l.v. line and reconstruction of existing network at Ewehurst.

House Wiring Plans

The borough engineer of Blyth (Mr. D. W. Foster) has submitted a report to the Housing Committee on the rewiring of older council houses. It is estimated that it would cost £21,000 to deal with 975 houses. No action is recommended until a report is considered on the availability of funds for carrying out the work.

A recommendation of the Newbury Housing Committee that electricity alone should be supplied to ten flats at Wash Common was recently approved by the Council. At a previous meeting a similar recommendation was referred back for reconsideration. The Committee claimed that the appearance of the flats would be spoiled if gas piping had to be taken into each flat and the cost would be greater.

Rawmarsh U.D.C. is to install immersion heaters and points for electric cookers in 120 houses on its Roundwood estate. In consequence the Yorkshire Electricity Board is to provide underground cables instead of under-eaves services.

Yugoslav Power Exports

The technical committee of Jugoeleksport, an organization of the U.N. Economic Commission for Europe (E.C.E.) which has been examining the question of constructing four large power plants on Yugoslav rivers, concluded its session in Zagreb recently. Delegates from Austria, Italy, Western Germany, and from the United Nations, who attended, expressed their conviction that the Yugoslav plans were economically sound. Detailed studies will now be submitted to the E.C.E. and after examination will be forwarded to the International Bank in Washington. It is expected that the first of the stations will be built on the Cetina River in Dalmatia where preparatory work is already in progress.

Industrialization in Manitoba

With the rapid growth of industry in the province, the Manitoba Hydro-Electric Board expects that new power sources will be required by the end of 1957. The next development will be a new steam plant at Brandon likely to cost $15–16 million with a generating capacity of at least 80,000 h.p. Engineering plans and specifications are already well advanced. The province's $22 million hydro-electric plant at McArthur Falls on the Winnipeg River is up to schedule. It is expected that four of the eight 10,000 h.p. units will be in operation by the end of the year.

With its completion the province will have four hydro-electric plants on the Winnipeg River: Seven Sisters and Great Falls (both acquired from the Winnipeg Electric Co. in 1952), and Pine Falls and McArthur Falls, the total capacity being 587,000 h.p.

ELECTRICITY SENT OUT BY AREA BOARDS FOR THEIR CONSUMERS

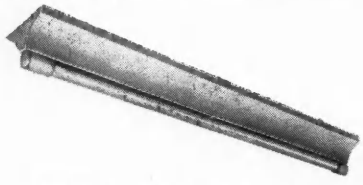
Area Board	Totals for February (million kWh)			Twelve Months Totals Ended 28th February (million kWh)		
	1953	1954	Inc. or Dec. %	1953	1954	Inc. or Dec. %
London	547·5	609·5	+ 11·3	5,488·0	5,691·8	+ 3·7
South Eastern	312·1	357·7	+ 14·6	3,174·6	3,389·0	+ 6·8
Southern	361·2	409·1	+ 13·3	3,708·1	3,973·7	+ 7·2
South Western	170·5	199·8	+ 17·2	1,780·4	1,938·4	+ 8·9
Eastern	496·1	570·1	+ 14·9	5,160·7	5,499·1	+ 6·6
East Midlands*	412·0	458·1	+ 11·2	4,399·3	4,684·7	+ 6·5
Midlands*	554·0	629·4	+ 13·6	5,964·2	6,279·8	+ 5·3
South Wales*	278·2	321·9	+ 15·7	3,283·7	3,553·3	+ 8·2
Merseyside and North Wales*	294·3	343·3	+ 16 6	3,347·8	3,530·9	+ 5·5
Yorkshire*	521·5	586·3	+ 12·4	5,786·3	6,119·4	+ 5·8
North Eastern*	304·4	341·6	+ 12·2	3,489·2	3,675·2	+ 5·3
North Western*	586·5	657·9	+ 12·2	6,332·2	6,855·8	+ 8·3
South East Scotland	112·4	130·6	+ 16·2	1,229·2	1,320·6	+ 7·4
South West Scotland* ...	278·2	314·3	+ 13·0	2,970·8	3,161·1	+ 6·4
Total all Area Boards ...	5,228·9	5,929·6	+ 13·4	56,114·5	59,672·8	+ 6·3
Direct Supplies by Central Authority	68·1	86·4	+ 26·9	749·6	998·2	+ 33·2
Grand Total	5,297·0	6,016·0	+ 13·6	56,864·1	60,671·0	+ 6·7
Mainly Industrial Areas* ...	3,229·1	3,652·8	+ 13·1	35,573·5	37,860·2	+ 6·4
Mainly Non-Industrial Areas	1,999·8	2,276·8	+ 13·9	20,541·0	21,812·6	+ 6·2
Total Number of Effective Working Days	25·86	25·86				

* Those in which industrial consumers took over 50 per cent of the total sales in the preceding financial year.

NEW ELECTRICAL EQUIPMENT

Fluorescent Fitting

AN IMPROVED design of the "Mazda Seagull" 5ft V-reflector fluorescent fitting is now available from the BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, London, W.C.2. Constructed in sheet steel



B.T.H. "Seagull" fluorescent reflector

and stove enamelled white, the fitting consists of a lamp auxiliary gear tray enclosed by a V-shaped reflector channel. The gear tray may be attached to the ceiling by the "Pendicone" suspension system. Auxiliary gear includes a "brick" type ballast and a "Permitol" impregnated capacitor.

Fixed b.c. lampholders are mounted on the reflector channel, which is attached to the gear tray by two captive knurled screws and is also held by chains for convenience of installation and maintenance.

Switch Mounting Blocks

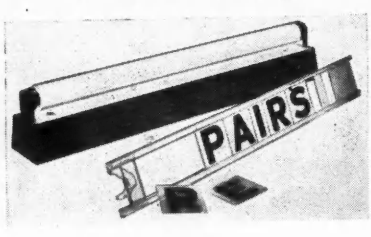
A further addition to its range of moulded switch mounting blocks is announced by the RADIAMP CO., LTD., Farningham Road, Tottenham, London, N.17. The new type enables electrical contractors to comply with I.E.E. Regulation 404J and is designed to house ceiling roses, batten holders and all standard switches. Knock-outs are provided for looping as well as back and side entry. It caters for both 1⅝in and 2in fixing centres and only requires two screws to fix both block and accessory.

Measuring 3⅛in across, the blocks are available in square or circular pattern, in brown or ivory white.

Letter Signs

The new advertisement letter signs now being marketed by SCEMCO, LTD., 6/7, Soho Square, London, W.1, are made up of 2½in square translucent "Perspex" pieces which slide into a neat frame of similar material. The frames, made in 2ft sections, are constructed with three clips for fixing to fluorescent tubes and are suitable for both horizontal and vertical positions. The sections can each accommodate nine letters, or spacer pieces, and when placed end to end they form a continuous run suitable for both 4ft and 5ft tubes. The letter colouring is red and the signs are legible in the dark at a distance of 75 yd. The 2ft frame with six letters and spacer pieces costs £1 5s; extra letters are 1s 6d each.

Scemco fluorescent letter signs



Convector Heater

The new round convector heater being manufactured by the DEXRAY ENGINEERING CO., LTD., Ardwick Green South, Manchester, 13, has an attractive bronze hammer stove enamel finish and is designed to give the maximum distribution of warm air. Air intake and outlets are covered by perforated metal bands through which the heated air is directed by means of an internal deflector plate. A circular universal handle enables the heater to be moved or handled in any direction. Both the handle and the outer casing are screened and consequently remain cool. The loading (1½ kW) can be reduced to 800 W by operating a chrome kick switch. The retail price is £4 13s 4d plus £1 15s purchase tax in the United Kingdom.

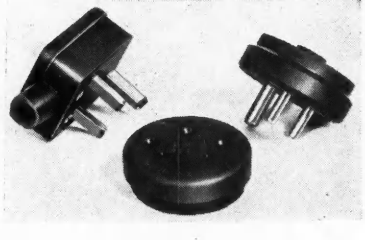
Moulded Rubber Accessories

Three additions have recently been made to the range of "Duraplug" moulded rubber plugs and sockets manufactured by W. W. HAFFENDEN, LTD., Richborough Rubber Works, Sandwich, Kent. One is a 13 A three-pin plug fitted with a 13 A fuse to B.S. 1362. Available in black or brown moulded rubber, the price is 4s 3d.

Also there is a 5 A three-pin panel mounting plug designed for mounting permanently on the side of electrical equipment. This can also be used in conjunction with the "Duraplug" weatherproof cable coupler socket, and is available in black only, price 4s 6d.

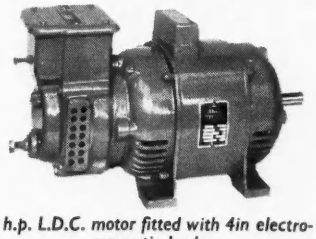
A 5 A cable coupler socket cover is for rendering the live portion of the socket safe when not in use and is made to fit snugly under the skirt of the socket, giving full protection when in position (see *Electrical Review*, 8th May, 1953, p. 1063). Price, black only, 2s 6d.

"Duraplug" rubber accessories showing 13 A plug (left), socket cover (centre) and panel mounting plug (right)



Electromagnetic Brake

In addition to its range of 6in and 8in electromagnetic brakes, LANCASHIRE DYNAMO & CRYPTO, LTD., Trafford Park, Manchester, 17, now manufactures a 4in brake designed for integral mounting on small L.D.C. motors up to approximately 2 h.p. at 1,500 r.p.m. according to the type of duty. Suitable only for horizontal machines, it is wound for single-phase operation up to 500 V 50 c/s, but can be arranged for use with both single- and



1 h.p. L.D.C. motor fitted with 4in electromagnetic brake

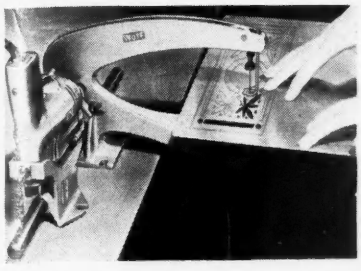
three-phase motors. It is also available for 500 V d.c. but for over 250 V a resistance is inserted in series with the coil.

The brake consists, essentially, of a 4in diameter steel disc keyed to the motor shaft extension, with asbestos fabric friction surfaces on each face of the disc. A pivoted brake lever arm causes pressure to be applied to one face of the friction disc, through the medium of a steel ring, and the other side comes into contact with a mating surface on the fixed back-plate. This pivoted arm is held in tension by a coiled spring at one end. At the other end the brake solenoid, when energized, pulls the arm against the coil spring tension, thus releasing the braking tension on the friction disc.

The size 4 brake has a maximum dynamic frictional torque of 7 lb/ft and when required a squared shaft extension can be provided so that the motor can be rotated by hand. Adjustments can be made in the air gap, emergency release operation and brake pressure by screws.

Fretsaw Set

The latest addition to the "Wolf Cub" range of home constructor equipment is a fretsaw attachment for use with the drill. The new fretsaw has an operating speed of 2,000 strokes per minute and a throat depth of 8 in enabling work to be cut to the centre of a 16in circle. Cutting capacity is ½in thick in wood or ⅛in in non-ferrous metal.



" Wolf Cub " fretsaw attachment

Special blades are employed. The drive is delivered by an eccentric arbor fitted into the drill chuck, through an ingenious rocker arm mechanism, thence to the saw blade by means of two nylon belts, which are claimed to last indefinitely. Complete with twelve high-speed blades for wood, plastics, etc., and twelve for non-ferrous metals, the new attachment is priced at £3 15s 0d. It is made by WOLF ELECTRIC TOOLS, LTD., Hanger Lane, London, W.5.

Armature Winding Machine

The " Quickway " heavy duty armature winding machine model No. 3 manufactured by the MIDLAND DYNAMO CO., LTD., Belgrave Gate, Leicester, is designed to wind conductors between 24 and 16 s.w.g. into slots of two-pole armatures of up to 6in diameter by 6in core length. The wire is fed from a de-reeling stand at the rear through a hollow driving shaft to the winding member, which in turn carries the wire around a stationary armature.

A looping attachment is provided for commutator lead connections and a foot operated index device rotates the armature from one slot to the next. The winding guides are locked and released by one lever facilitating quick indexing. The armature is held between a centre at one end and a toggle clamp at the other. This quick action clamp releases the armature for indexing or opens for its removal. The unit is floor mounted and provided with a variable speed single-phase motor to give winding speeds up to 100 turns/min. Foot operated controls give the operator's hands complete freedom.

Industrial Coffee Percolator

A new coffee percolator made by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, is available in one or three gallon sizes and has been designed for works canteens, restaurants, small hotels, etc. It operates on the same principle as the domestic percolator and the manufacturers claim that perfectly brewed coffee is available at all times.

Constructed from heavy gauge copper finished in chromium plate, it has a silver plated interior and coffee basket. Water is heated by copper-sheathed strip elements clamped to the inner bottom of the body. A safety device operates in the event of the percolator becoming dry. Full, half and quarter heat is provided by a three-heat rotary switch. The draw-off tap is fitted with an easily cleaned plug and the coffee basket and lid are supported on the percolator tube and stand. The one gallon size, loaded at 1 kW, is 9½in in diameter and stands 16in high, and the three gallon size, loaded at 2 kW, is 10⅝in in diameter and 21½in high.

The price of the 1 gal model is £19 15s (HO 91) and of the 3 gal size £24 3s (HO 93).

Sanitary Incinerator

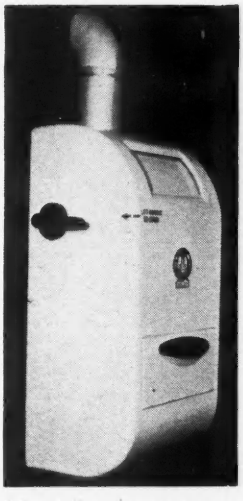
For the rapid and hygienic disposal of surgical and sanitary dressings the WANDSWORTH ELECTRICAL MANUFACTURING CO., LTD., 136, Cromwell Road, London, S.W.7, has introduced the " Bunnie " electrically operated sanitary incinerator. Each time the top hatch is opened a motor driven fan extractor comes into operation and an automatic timing device starts afresh so that articles may be inserted in quick succession. Combustion time is seven minutes, but an adjustment is provided to allow variation from five to ten minutes.

A drop-down door provides access to the withdrawable ash drawer. For use on a.c. only it has a voltage range of 200/220 or 230/250. The loading is 900 W and the finish ivory white with black fittings; the weight is 56 lb.

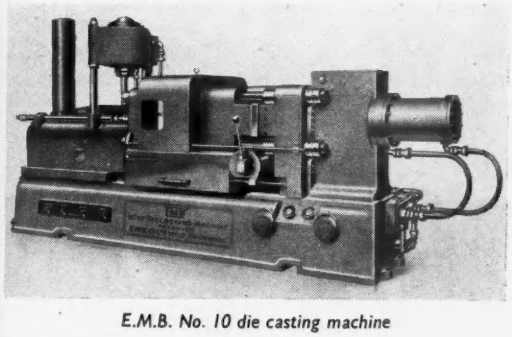
The overall dimensions are 23¼in high by 13⅛in wide by 10⅜in deep. The apparatus, which caters for approximately sixty people, is priced at £36; 3in diameter extractor pipe, in aluminium, costs 8s per ft and right-angled bends 9s each.

Die Casting Machine

The latest addition to the range of die casting machines made by E.M.B. CO., LTD., Moor Street, West Bromwich, Staffs., is a very high speed injection machine, designated No. 10, which is suitable for the rapid production of sound, well-finished castings in zinc alloys with the minimum of fatigue. The guards are interlocked with the operating handle and compressed air operation eliminates any fire risk. Control is by a single handle which enables the dies to be closed rapidly without slam, locked, and the metal injected. For die setting, any speed down to dead slow is available. For very heavy section castings in zinc and lead a slow controlled speed injection head can be fitted as an extra. Heating of the metal is by gas, with an electronic temperature controller. A cold chamber model is also available for producing castings in aluminium, magnesium and copper alloys.

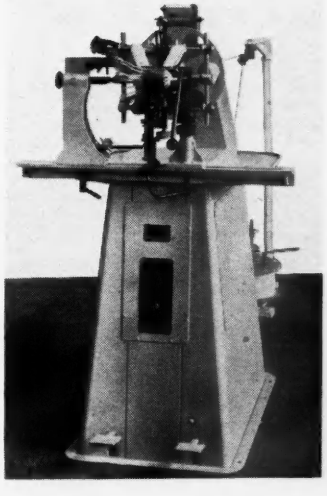


" Bunnie " sanitary incinerator



E.M.B. No. 10 die casting machine

" Quickway " armature winding machine



The G.E.C. coffee percolator showing its large coffee basket supported on the percolator tube and stand

Financial Section

STOCKS and SHARES

STOCK Exchange markets await the Budget this time without anything very noticeable in the way either of trepidation or optimism. On the figures available, the experts seem to be agreed that the overall outcome of the nation's financial year should be rather better than anticipated. With estimated expenditure for 1954–55 at a record level, however, and with some of last year's tax concessions only now coming home to roost, the Chancellor is not regarded as having much scope for tax reduction. The gilt-edged market continues to discuss seriously the question of a lower Bank Rate, and this assists, on balance, to support prices. In the industrial market, the very large sums tied up temporarily in applications for the £30 million I.C.I. loan stock (for which subscription lists closed last Wednesday), tends to impose a certain measure of restraint upon activity.

Price Changes

Price movements among electrical equipment shares have been irregular during the week, with gains, however, in the majority. Plessey shares have again been prominent, rising another 2s. Deccas, in their 4s form, were also to the fore in advancing 1s 9d to 35s 9d, with the new shares at 31s 6d premium and the preference at 18s. De La Rues continued to attract interest and went up 9d. In the heavy group, Babcocks, W. H. Allen and International Combustions were noticeably good. Falk, Stadelmann at 40s are 2s 9d to the good. Among other improvements worthy of mention were those in Brush, Brook Motors, Bakelite, Lancashire Dynamo, Parnall Yate and Laurence, Scott. Changes in the other direction left lower prices for Enfield Cable, B.I.C.C., Automatic Telephone and a few others.

April Dividends

Next month should produce the final dividend declarations from the Reyrolle and Parsons companies. In anticipation of the coming results, the shares of both have been among the best supported issues in the industrial market over the past year. Other April declarations of importance are expected to come from the cable manufacturing group, including B.I.C.C., Enfield, J. & P. and Telegraph Construction. In the electric battery section, the Chloride Electrical announcement is awaited with particular interest, and Ever Ready usually publish results at about the same time. Allen West shares have been a good market lately in advance of the dividend. News of the same kind will be due soon from, amongst others, Lancashire Dynamo, Veritys, Watford Electric, Telegraph Condenser and Laurence, Scott.

English Electric Meeting

Since the publication of the full accounts, English Electric £1 shares

Week's Price Changes

Company or Board	Nom. Value	Middle price 22nd Mar.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1953 Highest	1953 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	90		3	3	3 6 9	90	83 11/16
Brit. Elec. 1974/77	100	89		3	3	3 7 6	89	82
Brit. Elec. 1976/79	100	96		3½	3½	3 13 0	94¾	88⅝
Brit. Elec. 1974/79	100	104½		4¼	4¼	4 1 3	104	99⅛
Overseas Electric Supply								
Calcutta Elec.	£1	20/-		6†	6†	6 0 0†	21/-	18/-
East African Power	£1	22/6		7	7	6 4 6	25/-	20/9
Nigerian Elec.	£1	23/6		10	10	8 10 3	25/-	21/6
Palestine Elec. "A"	£1	18/-	−1/-	Nil	Nil	Nil	19/3	7/7
Perak Hydro-Elec.	£1	15/-	+6d	Nil	6	8 0 0	17/10	13/6
Equipment and Manufacturing								
Aberdare Cables	5/-	8/3		20	20	7 7 0*	8/9	7/4
Aerialite	1/-	11/9	−3d	88¼	88¼	7 10 6	11/6	8/1
Allen, W. H.	£1	55/9	+2/-	15	15	5 7 6	51/-	42/10
Aron Elec. Ord.	£1	45/-	+1/3	15	20	8 17 9	47/6	36/3
Assoc. Elec. Ord.	£1	44/9xd		20	11¼*	5 0 6	45/7	36/4
Automatic Tel. & El.	£1	65/-	−1/3	15	15	4 12 3	65/3	55/-
Babcock & Wilcox	£1	50/-	+1/9	18	18	—	50/-	40/4
Baldwin, H. J.	2/-	4/6	−3d	20	20	8 18 0	4/1	3/-
Bakelite	10/-	24/-	+9d	12½	12½	5 2 0	24/9	16/-
British Aluminium	£1	38/-	−6d	12	12	6 6 3	43/10	35/-
B.I. Callender's	£1	40/-	−1/-	9	10	5 0 0	40/10	33/3
B.I. Callender's 6% Pref. ...	£1	26/-		6	6	4 12 3	26/3	23/-
British Thermostat	5/-	20/-		30	35	—	19/-	14/-
British Vac. Cleaner	5/-	13/3	−9d	25	25	9 8 9	16/6	11/-
Brook Motors	10/	35/6	+1/-	20	20*	5 12 9	37/-	27/10
Brush Ord.	5/-	6/-	+3d	10	4	—	5/4	2/11
Bulgin, A. F.	1/-	3/4½		30	30	8 11 6	3/5	2/6
Burco	5/-	13/-		35	35	6 14 8*	12/2	8/6
Chloride El. Storage	£1	50/-	−9d	15	20	4 0 0*	44/10	32/3
Clarke Chapman	£1	75/9		17½	20	5 5 6	70/6	57/6
Cole, E. K.	5/-	24/-	−3d	25	25*	5 4 3	23/9	14/2
Cossor, A. C.	5/-	7/6	−6d	10	10	6 13 4	11/4	6/4
Crabtree	10/-	26/3	+1/3	17½	17½	6 13 4	32/6	23/9
Crompton Parkinson Ord. ...	5/-	16/-	+3d	11¼	20	6 5 0	16/-	8/7
De La Rue	5/-	13/9	+9d	35	Nil	Nil	14/6	6/3
Decca	4/-	35/9	+1/9	150	35*	—	37/9	17/6
Desoutter	5/-	17/9		18	20	5 12 9	17/6	14/3
Dewhurst	2/-	5/6	−3d	19	19	6 18 3	6/9	5/-
Dictograph Tel.	2/-	5/9		20	20*	6 19 3	5/10	3/10
Dubilier Condenser	1/-	4/9		28	25*	5 5 3	4/4	2/10
E.M.I.	10/-	13/9	−9d	12	8	5 16 3	15/3	11/6
Electrical Components	5/-	11/3		20	20	8 17 10	12/-	9/3
Elec. Construction	£1	56/3	−3d	15	15	5 6 8	56/-	50/6
Enfield Cable Ord.	£1	17/6	−1/6	7½	5	5 14 3	24/10	17/-
English Electric	£1	40/-		15	10*	5 0 0	40/8	34/-
English Electric 3½% Pref. ...	£1	15/6xd		3½	3½	4 15 3	16/4	14/6
Ericsson Tel.	5/-	47/6xd		22†	25†	2 12 9†	48/9	36/-
Ever Ready	5/-	27/-	−6d	35	35	6 9 9	29/-	25/-
Falk Stadelmann	£1	40/-	+2/9	15	15	7 10 0	44/3	38/3
G.E.C. Ord.	£1	40/-		22½	11¼*	5 12 6	46/-	36/3
G.E.C. 6½% Pref.	£1	27/-		6½	6½	4 16 3	27/7	24/9
General Cables	5/-	16/9		30	30	8 19 2	17/-	14/9
Greenwood & Batley	£1	43/9		15	17½	8 0 0	41/6	38/-
Hackbridge Cable	5/-	13/6		20	20	7 8 3	13/-	10/4
Hackbridge & Hewittic	5/-	18/6	+3d	20	20	5 8 0	18/3	16/1
Hall Tel .Acc.	10/-	11/6	+6d	10	10	8 13 10	12/7	8/6
Heatrae	2/-	4/-		12½	12½	6 5 0	4/3	3/3
Henley's	10/-	16/6		20	10½*	6 7 3	19/4	16/-
Holophane	5/-	14/9		20	20	6 15 7	13/9	11/1

* After capital bonus. † Free of income tax.

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.

have been steady at around 40s, showing a 5 per cent yield on the basis of a 10 per cent dividend. The latter is put in perspective by the "breakdown" figures given by the chairman, according to his custom, at the annual meeting. They show that of every £100 received by this group during the year, £50 was spent on materials; £30 on wages and salaries; £14 on depreciation and interest; and £4 on taxation. To net dividends on preference and ordinary stocks went something under £1, leaving about 27s of the £100 to be retained in the business. Sir George Nelson's general review reports a further substantial increase during the year in production and turnover, with orders on hand sufficient to assure the maintenance of the 1953 volume.

...in Electrical Investments

Company or Board	Nom. Value	Middle price 22nd Mar.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1953 Highest	1953 Lowest
Equipment and Manufacturing—continued.						£ s d		
Hoover	5/-	31/-xd		25	45	7 5 3	26/10	20/3
I.C.I.	£1	56/6		13	15	5 6 2	54/-	41/6
Intl. Combustion	5/-	19/-	+6d	15	20	5 5 3	15/6	12/1
Johnson & Phillips	£1	51/-	+1/-	15	15	5 17 9	59/3	49/-
Lancashire Dynamo	£1	46/3	+1/9	12½	12½	5 8 0	47/-	41/-
Laurence, Scott	5/-	16/9	+6d	15	15	4 9 6	14/6	11/9
Lister, R. A.	£1	35/9	+9d	9	12	6 14 3	34/3	27/9
London Elec. Wire	£1	39/-		12½	15	3 17 0*	38/3	26/-
Lucas, J.	£1	58/-	−6d	9⅛	10⅝	3 15 3	51/3	35/6
Marryat & Scott	2/-	6/6		22½	22½	6 18 6	6/3	5/1
Mather & Platt	£1	55/6		12½	15	5 8 0	53/10	41/3
Metal Industries	£1	31/3	−3d	15	12*	7 13 6	47/9	37/9
Midland Elec. Mfg.	£1	63/3xd		15	15	4 14 9	63/9	56/3
Morphy-Richards	4/-	14/6xb		40	40	—	16/3	13/-
Murex	£1	51/-		15	15*	5 17 8	60/9	50/6
Newman Ind.	2/-	2/3	−1½d	10	10	8 17 9	2/10	2/-
Oldham & Son	1/-	2/9		35	17½*	6 7 3	2/10	2/2
Parnall (Yate)	5/-	6/3	+1/-	6	6	4 16 0	4/9	2/6
Parsons, C. A.	£1	42/6		10*	12½	—	48/-	27/9
Plessey	5/-	46/-	+2/-	25	30	3 5 3	37/-	20/1
Pye Deferred	5/-	20/-	+1/-	18	20	—	16/3	10/6
Revo	10/-	17/6		27½	27½	—	17/6	13/11
Reyrolle	£1	72/6		10*	12½	—	79/-	51/-
Rheostatic	4/-	12/-		19	20	6 13 4	12/-	8/-
Richardsons Westgarth	5/-	11/-		12	15	6 16 3	11/1	8/6
Scottish Cable	4/-	14/3		32	20*	5 12 3	13/3	11/1
Siemens Ord.	£1	38/-	−3d	10	10	5 5 3	37/-	31/6
Smith (England), S.	4/-	8/9	+3d	12½	15	—	12/6	7/11
Southern Areas	£1	18/-	+6d	5	6	6 13 4	19/7	10/3
Strand Elec.	5/-	8/9		17½	17½	10 0 0	10/-	7/9
Sturtevant	5/-	33/9		17½†	18·1†*	—	29/9	20/10
Sun Elec.	£1	27/6	+2/6	15	15	10 18 3	27/-	24/6
Switchgear & Cowans	5/-	10/-	−2/6	22½	10	5 0 0	16/9	12/6
Taylor Tunnicliff	5/-	11/3		25	12½*	5 11 0	12/3	9/6
T.C.C.	10/-	44/6		20	20*	—	42/6	31/5
T.C. & M.	£1	30/9	−6d	10	8½*	5 10 6	31/6	25/6
Telephone Mfg.	5/-	8/6		10	10	5 17 8	9/4	7/1
Thorn Elec.	5/-	17/-	+3d	12½	12½	3 13 6	14/-	7/10
Thornycroft	£1	35/-	−1/3	15	15	8 11 6	54/-	29/9
Tube Investments	£1	61/3		15*	15	4 18 0	71/9	54/-
Vactric	5/-	9/6		Nil	Nil	Nil	10/3	3/6
Veritys	5/-	6/6	−6d	7½	10	7 13 9	5/4	4/1
Walsall Conduits	4/-	47/-	+9d	70	70*	5 19 3	47/6	43/9
Ward & Goldstone	5/-	45/-		45	45*	5 0 0	46/-	29/9
Watford	2/-	6/3	+6d	25	25	—	5/6	4/10
Westinghouse Brake	£1	67/6		14	15	4 9 0	64/-	51/3
West, Allen	5/-	15/-	+3d	15	15	5 0 0	14/4	10/3
Wolf Electric	5/-	13/-	−6d	—	15	5 15 6	12/8	9/6
Trusts, Transport and Communications								
Anglo-Am. Tel.:								
"A" Ord.	100	89½	+2	—	6	6 14 0	91	77
"B" Ord.	100	55½	+3	—	3¾	6 15 3	57½	53
Anglo-Portuguese	£1	21/-		8	8	7 12 6	23/9	20/1
Brit. Elec. Traction:								
Def. Ord.	5/-	43/-	+6d	25	35	4 1 5	39/6	21/3
Cable & Wireless:								
Ord.	£1	34/-	+6d	8	9	5 6 0	148	124
5% Loan	100	96½		4	4	4 3 0	97¾	93
Calcutta Trams	£1	18/-	−1/-	6†	2½†	—	23/6	16/-
Cape Elec. Trams	£1	14/6		5½	5½	7 11 9	13/-	9/-
Marconi Marine	£1	28/3		10	10	7 1 7	31/6	26/9
Oriental Tel. Ord.	£1	79/6		16	16	—	75/-	59/-
Telephone Props.	£1	4¾		8	8	—	126/3	33/-
Telephone Rentals	5/-	9/6		10	10*	—	10/-	6/8

Richardsons Westgarth Bonus

The 5s ordinary shares of Richardsons Westgarth have been changing hands around 11s since news of the company's proposal to distribute from reserves a one-for-three share bonus. The announcement was accompanied by the now customary advice that it carries no implication as to the amount of subsequent dividends, the rate of which will continue to be decided by reference to trading results, and to the need for retaining a substantial proportion of profits in order to finance future expansion. The company's financial year ends with this month, and the single annual distribution, together with the preliminary profits statement, was declared last time in July. On that occasion the company reported a marked rise in earnings, and an increase in the ordinary dividend from 12 to 15 per cent. Assuming no change in the amount of the dividend, the yield on the shares is a little over 6½ per cent.

Company News

The interim dividend of 10 per cent declared by E. K. Cole is at the same rate as before, but goes to capital increased by the one-for-six share bonus distributed a year ago: results for the financial year just ending will be expected in June. Switchgear & Cowans 5s shares made a partial recovery from a setback caused by the reduction of the dividend to 10 per cent, but at 10s the price finished 2s 6d down on the week. Morphy-Richards 4s shares are now quoted ex the 50 per cent share bonus, and stand at 14s 6d in the new form. The company has declared the intention (barring unforeseen events) of paying on the increased capital the same rate of final dividend, namely 25 per cent, as was distributed last year. With net taxed profits for 1953 a little above the previous year's, Newman Industries are again paying a 10 per cent dividend. At 2s 3d the 2s shares show a yield of approximately 9 per cent.

Canadian Power

Investors have become largely interested in Canadian electric and other public utility undertakings since nationalization removed from their ken a particularly useful and reliable field of investment in this country. Among the most popular of them are the common shares of the Shawinigan Water & Power Company, which issued its annual results a week ago. The record of this undertaking shows the steadily consistent growth of revenue, with the occasional increase in the rate of dividend which is the special attrac-

tion of this type of security. Record revenue is disclosed in the latest accounts and, although the dividend is held for the fourth successive year at $1·45 per share, it is well covered by earnings equivalent to $2·26 per share. With the shares quoted in London at $77 (say £15 8s) the straight yield is a moderate 3½ per cent, but, by the operation of double tax relief on dividends, the return may be raised effectively to the equivalent of 5 per cent gross, or more, in the case of a United Kingdom shareholder.

Wireless Relay

Interest in the shares connected with the British Relay Wireless & Television enterprise was revived by a newspaper report of the latter's progress. According to this, the service is now in operation in a part of London, and plans are laid for its wider extension. The 5s "A" shares of the company directly concerned remain a firm market at 16s 9d. Of the shares in the two firms largely interested in its development, Murphy Radio 5s ordinary stand at about 9s 6d, and Pye 5s deferred have risen to 20s. The former company is due to declare its final dividend within a week or two. Pye's financial year ends this month, and the results will be expected in July; a one-for-two share bonus has been distributed since last year's 20 per cent payment.

REPORTS and DIVIDENDS

The English Electric Co., Ltd.—The annual meeting was held on 17th March, Sir George Nelson (chairman) presiding. In presenting the report and accounts, the chairman said that during the year under review there had been a further substantial increase in both production and turnover which fully justified the additional manufacturing facilities already in operation and further extensions in hand. The orders in their books ensured the maintenance of the 1953 volume in 1954, but, whilst home orders in 1953, as a result of marketing new products, exceeded those of 1952, competition from overseas manufacturers in the export markets had greatly increased, prices and contract conditions were much less attractive, and the volume of orders for export markets in 1953 had fallen by comparison with 1952.

Dealing with the economic position, Sir George said that he still believed, in spite of greatly increased competition in overseas markets, that if we maintained our efforts the economic position of the country could continue to improve, and he suggested that the means by which this could be achieved were maintenance of our technical lead, increased production, lower cost, and incentives for extra output. Referring to the strengthening of the bonds with the Commonwealth, the English Electric group had sent to Canada, Australia and South Africa its most able engineers and administrators, and in Canada the opportunity had been taken of reuniting the Canadian Marconi Co. with the group, by the purchase of the whole of the shares of the Canmar Investment Co., Ltd., which held 50·6 per cent of the capital. Export shipments in 1953 exceeded those for 1952, but incoming orders for heavy capital goods were not so great as in former years.

Expenditure on research and development in normal business was greater than in previous years and continued at a high figure in the defence field. Regarding manufacturing facilities, the new works at Netherton, on Merseyside, had come into operation and the last part would be finished during the current year. Industrial electronic activity had been moved from Stafford to a new factory at Kidsgrove. The factories in Australia had work in hand on an important hydro-electric contract for Tasmania, and for other parts of the Australian Commonwealth. A further increase in output had been achieved by the Benoni Works in South Africa.

Sir George reviewed some of the more important engineering events of 1953. These included the commissioning of the third and fourth 66 MW sets at the J. Clark Smith station of the Hydro-Electric Power Commission of Ontario. The first 60 MW set with a steam turbine operating at 1,500 p.s.i. 1,050 deg F to go into commission in this country was completed and ready for operation at the end of 1953. The most notable order received during 1953 for the B.E.A. was for the first two 100 MW sets for Willington. In the field of water turbines they had orders at present for 37 major units totalling over a million h.p. Orders included water wheel generators for the McNary Dam, U.S.A., and four 175,000 b.h.p. turbines for the Quebec Commission's Bersimis power station, the latter to be built in one of the factories of the associated company in Canada.

Diesel engines continued to be in demand in the export field, and for electric traction a notable achievement had been the development of the first 50 c/s single-phase railway equipment built in this country. Steelworks equipment commissioned included a 20,000 h.p. twin-drive for a hot reversing mill in Canada. Other equipment commissioned and in production included mining and marine plant, switchgear, transformers, rectifiers, textile mill equipment, relays and instruments. In the domestic appliance section a new refrigerator and automatic cooker models had been introduced.

Sir George concluded his review with references to the subsidiary companies which include the Marconi group, D. Napier & Son, Ltd., and the English Electric Valve Co., Ltd.

Marconi's Wireless Telegraph Co., Ltd.—In the course of his speech at the annual meeting held on 17th March, Sir George Nelson (chairman) said that at home the abnormal rate of booking of orders in recent years due to the pressure of rearmament had slowed down noticeably in the year under review. Competition in world markets was also growing. In the aeronautical section, their ground equipment for air navigation was used by the United States Air Force during flights of an important nature. An order had been received for the first station of this kind to be installed in Switzerland. The demand for airborne and ground communication equipment and navigational aids by leading airlines, aircraft manufacturers and airport companies at home and overseas remained good.

In the field of radio propagation competition from Germany and America was becoming stronger, but sales were at a high level and recent contracts included the restoration of the telecommunications system of Burma.

After referring to the success of the television cameras and control equipment for the Coronation service, Sir George said that the Canadian Broadcasting Corporation had selected their equipment for stations in Montreal, Toronto, Vancouver, Ottawa, Halifax and Winnipeg. Of the orders received from the B.B.C., the outstanding one was for vision and sound transmitters for the future B.B.C. London station at the Crystal Palace. The bulk of the work for the Services was of a secret nature, but they had supplied ground defence radar schemes at home and to many Commonwealth and foreign countries. Maritime installations included the completion of the programme for equipping with radio beacons 45 lightships and lighthouses in United Kingdom home waters. Marconi Instruments had once again experienced a record turnover.

The Marconi International Marine Communication Co., Ltd.—Presiding at the annual dinner held on 17th March, Sir George Nelson (chairman) said that the British merchant fleet now compared in size with that of 1939 and they had received orders for ships' radio equipment for the greater part of this fleet. Much of the work during the year under review had been concerned with the further preservation of life and ships at sea for the Merchant Shipping (Radio) Rules were now coming into full operation. Their marine radar equipment continued to be in strong demand production was now in front of demand and they were able to take further orders for quick delivery.

A considerable expansion in the range of radiotelephone transmitters and receivers had had to be effected

to meet the needs of smaller vessels; for others they had produced transmitter-receivers incorporating direction-finding facilities in the receiver section of the instrument. They had evolved a new and more advanced automatic-alarm receiver. The Government's grant-and-loan programme, aimed at aiding the fishing industry to build 500 new vessels during the next ten years, was providing an added market for Marconi marine products. In the range of sound-reproducing equipment new receivers, amplifiers and loudspeaker systems were now available.

Switchgear & Cowans, Ltd., reports that after providing for depreciation, debenture interest and directors' remuneration, there is a profit of £54,054 for 1953, as compared with £107,209 for the preceding year. The balance, after deducting £35,250 for taxation is £18,804 (against £29,009). It is proposed to pay a dividend for the year of 10 per cent (against 20 per cent and a bonus of 2½ per cent) and to carry forward £70,645 (against £68,910 brought in).

Bakelite, Ltd., reports group profits for 1953, after meeting all charges, including £87,986 special expenditure on a new factory, of £332,367, as compared with £562,660 for 1952. From this is deducted debenture, £24,083, and taxation £55,535 (against £321,300), leaving an available profit of £252,749 (£241,360). It is proposed to maintain the dividend for the year at 12½ per cent by a final payment of 9½ per cent.

A. F. Bulgin & Co., Ltd.—The accounts for the year to 31st January last show a net profit of £29,497, as compared with £27,383 for the preceding year. General reserve receives £10,000 and the dividend for the year is maintained at 30 per cent. The balance carried forward is £30,280 (against £25,162 brought in).

Newman Industries, Ltd., reports a trading profit for 1953 of £169,734, as compared with £178,744 for 1952, and after meeting all charges, including £62,600 for taxation, there is a net balance of £24,611 (against £19,911). The ordinary dividend for the year is maintained at 10 per cent and £105,873 is carried forward (against £102,075 brought in).

Richardsons, Westgarth & Co., Ltd., propose to make a one-for-three scrip issue by capitalizing £442,340 from reserves. The directors state that the capitalization bears no implication as to the amount which will be paid out as dividend.

E. K. Cole, Ltd., have declared an interim dividend of 10 per cent. This is at the same rate as a year ago, but is payable on ordinary capital increased to £294,075 by a 16⅔ per cent scrip issue. The 1952-53 final dividend of 15 per cent was paid on the present capital.

New Companies

Sunbeam Electric, Ltd.—Registered 15th March. Capital £350,000. Manufacturers of and dealers in electrical and mechanical appliances and devices for household, personal and industrial use, or for use in connection with agriculture, gardening, fruit growing and animal husbandry, etc. So long as Sunbeam Corporation (organized under the laws of the State of Illinois, U.S.A.) hold not less than 75 per cent of the issued capital they shall have the right to appoint and remove any director. The first directors are not named. Solicitors: Slaughter & May, 18, Austin Friars, London, E.C.2.

Bootle Bros., Ltd.—Registered 27th February. Capital £2,000. Electrical contractors and engineers, electronic, radio and television engineers, etc. Directors: D. T. Bootle and R. G. Bootle. Regd. office: 109, Bramblewood Close, Carshalton, Surrey.

Burford Electric Co., Ltd.—Registered 10th March. Capital £2,500. Manufacturers of and wholesale or retail dealers in electrical apparatus and equipment, radio and television apparatus, etc. Directors: M. C. Balivet and H. J. Golding. Regd. office: 14, St. Martins House, 29, Ludgate Hill, E.C.4.

Rediffusion Vision, Ltd.—Registered 6th March. Capital £60,000. The first directors are to be appointed by the subscribers. Regd. office: Carlton House, Lower Regent Street, W.1.

Curtis Holt (London), Ltd.—Registered 5th March. Capital £10,000. To undertake the distribution of Black & Decker portable electric tools and other engineering tools or equipment stocked or dealt in by C. Curtis Holt, Ltd., of Leeds. The first directors are to be appointed by the subscribers. Regd. office: 10/11, Central Buildings, Southwark Street, S.E.1.

Increases of Capital

James Scott & Co. (Electrical Engineers), Ltd.—Increased by £80,000, in 30,000 6 per cent cumulative redeemable preference shares of £1 and 500,000 ordinary shares of 2s, beyond the registered capital of £200,000.

Midland Dynamo Co., Ltd.—Increased by £47,000, in 40,000 ordinary, 5,000 6 per cent "A" redeemable preference and 2,000 6 per cent "B" redeemable preference shares of £1, beyond the registered capital of £40,000.

South Wales Switchgear, Ltd.—Increased by £100,000, in 400,000 ordinary shares of 5s, beyond the registered capital of £250,000.

Liquidations

Harry George (Surbiton), Ltd., radio and electrical engineers.—Winding up. Liquidator, Mr. A. W. Hunter, Latham & Co., Walter House, 418-422, Strand, London, W.C.2, appointed 1st March.

Selways Neon Lighting of Wales, Ltd.—Winding up voluntarily. Liquidator Mr. G. G. Thomas, 7-10, Oxford Buildings, Lower Union Street, Swansea, appointed 8th March.

Pleasure Radio, Ltd.—Meetings of members and creditors on 14th April at the offices of Poppleton & Appleby, 126, Colmore Row, Birmingham, to receive an account of the winding-up (pursuant to section 300 of the Companies Act) by the liquidator, Mr. R. F. Bendall.

Bankruptcies

S. Edmondson, Main Street, Milnthorpe, Westmorland, electrical dealer and contractor, trading as "E. & B. Radio."—Trustee, Mr. L. H. Shipton, 31, Lloyd Street, Manchester, 2, released 11th February.

J. Hilbert, 17, Manchester Road, Haslingden, Rossendale, Lancs., radio and electrical engineer.—Trustee, Mr. A. T. Eaves, 47, Mosley Street, Manchester, 2, released 20th February.

A. J. Digby, 238, Walworth Road, London, S.E.17, and 22F, Doughty Mews, W.C.1, electrical contractor.—Last day for receiving proofs for dividend 6th April. Trustee, Mr. W. F. Cresswell, Bankruptcy Buildings, Carey Street, London, W.C.2, Official Receiver.

W. J. Standing, 7, Brook Street, Chester, electrician.—Public examination 13th May at the Castle, Chester.

E. Vasey, 21, Bridge Road, Bishopthorpe, York, electrician.—First and final dividend of 2s 2d in the £, payable on or after 31st March at the Official Receiver's office, 29, East Parade, Leeds, 1.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to the dates stated:—

3rd April

KALORIK (design). No. B714,214, Class 9. Electric resistances, flat irons, domestic vacuum cleaners, polishing machines, coffee grinders, cobblers' irons, radio and television apparatus, electrically heated soldering irons, etc.—J. L. D. Fievez, Brussels, Belgium. Address for service, c/o Frank B. Dehn & Co., Kingsway House, 103, Kingsway, London, W.C.2.

PECO. No. B714,243, Class 9. Apparatus and instruments for use in physics: scientific, nautical, surveying and electrical apparatus and instruments, etc.—Plaubel Feinmechanik und Optik, Frankfurt-am-Main, Germany. Addres for service, c/o H. D. Fitzpatrick & Co., 94, Hope Street, Glasgow, C.2.

EGEN. No. B721,028, Class 9. Electric potentiometers, volume controls, resistors and small electric switches.—Egen Electric, Ltd., Charfleet Industrial Estate, Canvey Island, Essex.

THORN ELECTRICAL INDUSTRIES, LTD. (design). No. 644,048, Class 11. Electrical apparatus for lighting.—Thorn Electrical Industries, Ltd., 105 to 109, Judd Street, London, W.C.1.

WIREOHMS (design). No. 705,692, Class 11. Thermo-electric heating elements.—Wireohms, Ltd., Peas Hill Road, Nottingham.

KINESOL. No. 718,513. KINOSOL. No. 718,514. Class 11. Arc lamps: and lamps for projectors.—Zeiss Ikon Akt.-Ges., Stuttgart, Germany. Address for service, c/o Frank B. Dehn & Co., Kingsway House, 103, Kingsway, London, W.C.2.

MEDELEC. No. 726,039, Class 11. Electric light fittings.—Moore & Partners (Engineering), Ltd., 3, Devonshire Grove, Old Kent Road, London, S.E.15.

10th April

ARMEND. No. 724,244. ALUMEND. No. 724,245. MINAC. No. 724,255. Class 9. Electrodes for electric welding.—Rockweld, Ltd., Commerce Way, Croydon, Surrey.

DIPLOMAT. No. 725,241, Class 9. Dictating machines, sound recording and reproducing apparatus, sound amplifiers, telephonic apparatus, etc.—Thermionic Products, Ltd., Shore Road, Hythe, Southampton.

NEXT WEEK'S EVENTS

Organizers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

Monday, 29th March

BIRMINGHAM.—James Watt Institute, Great Charles Street, 6 p.m. I.E.E. South Midland Centre. "The Development and Application of Nuclear Reactors," by R. V. Moore.

LEEDS.—The University, 7.30 p.m. Incorporated Plant Engineers, West and East Yorks Branch. "High Frequency Heat Treatment," by Dr. K. J. Irvine.

LONDON.—Savoy Place, 6.30 p.m. I.E.E. London Students' Section. "The Mechanism of the Electric Spark and some Applications," by Dr. C. Grey Morgan.

MANCHESTER. — Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Centre. "The Kemano Hydro-Electric Development and associated Kitimat Aluminium-Reduction Works," by F. L. Lawton.

Tuesday, 30th March

BIRMINGHAM.—James Watt Institute, 6.30 p.m. I.E.E. South Midland Education Discussion Circle. "Fundamental Electrical Engineering in the Rationalized M.K.S. System," by H. K. P. Burt.

CAMBRIDGE.—University Arms Hotel, 7 p.m. I.E.E. East Midland Centre, district meeting. "Earthing," by P. W. Cave.

CHELMSFORD.—Drill Hall, 185, London Road, 7 p.m. I.E.E. London Students' Section, district meeting. "Servo Mechanisms," by Capt. R. A. Middleton.

LONDON.—Manson House, Portland Place, 7 p.m. Society of Instrument Technology. "Automatic Control in the Iron and Steel Industry," by S. S. Carlisle.

LOUGHBOROUGH.—The College, 6.30 p.m. I.E.E. East Midland Centre. "Some Problems of a Plant Engineer in a Nuclear Chemical Division," by W. E. Harris.

MANCHESTER. — Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Measurements Group. "Measurement of the Winding Resistance of a 132 kV Power Transformer in Service," by Dr. K. J. R. Wilkinson and J. D. Harmer. "An Automatic Plotter for Magnetic Hysteresis Loops," by H. McG. Ross.

OXFORD.—Cadena Café, Cornmarket Street, 7 p.m. Institute of Metals, Oxford Local Section. Annual general meeting followed by a discussion.

STRATFORD-ON-AVON.—I.E.E. Rugby Sub-Centre Students' Section. Theatre visit, "Othello."

WOLVERHAMPTON.—Star & Garter Royal Hotel, 7 p.m. Institution of Works Managers, Wolverhampton Branch. "The Manufacture of Ball and Roller Bearings," by R. E. W. Smith. Illustrated by films.

YORK.—Royal Station Hotel, 7 p.m. I.E.E. North Midland Centre. "Design Features of Certain British Power Stations," by S. D. Whetman and A. E. Powell.

Wednesday, 31st March

LONDON.—Café Royal, 7 p.m. I.E.E. Radio and Measurements Sections. Joint dinner-dance.

London School of Hygiene and Tropical Medicine, Keppel Street, W.C.1, 6.30 p.m. British Institution of Radio Engineers, London Section. "Radio Astronomy," by R. Hanbury Brown.

Thursday, 1st April

CARDIFF.—At the South Wales Institute of Engineers, Park Place, 6 p.m. Association of Mining Electrical and Mechanical Engineers, South Wales Branch. "Communications and Signalling in Mines," by A. Erickson and T. P. Priest.

Grand Hotel, Westgate Street, 7.30 p.m. Incorporated Plant Engineers, South Wales Branch. Annual general meeting.

CHATHAM.—Sun Hotel, 7.15 p.m. Institute of Welding, Medway Section. Annual general meeting, followed by films.

GLASGOW.—39, Elmbank Crescent, 6.30 p.m. I.E.S. Glasgow Centre. Discussion on "The Lighting Engineer."

At the Institution of Engineers and Shipbuilders, 7 p.m. British Institution of Radio Engineers, Scottish Section. Members' papers.

GLOUCESTER.—2, St. Aldate Street, 6.30 p.m. I.E.S. Gloucester and Cheltenham Centre. "The Effect of Light in the Growth and Development of Plants," by Miss D. Vince.

HULL.—Y.E.B., Ferensway, 7.15 p.m. I.E.E. North Midland Centre. "Voltage Transformers and Current Transformers associated with Switchgear," by W. Gray and A. Wright.

LIVERPOOL.—Electricity Service Centre, Whitechapel, 7 p.m. British Institution of Radio Engineers, Merseyside Section. "Logic, Algebra and Relays," by Prof. E. Williams.

LONDON.—Savoy Place, 5.30 p.m. Institution of Electrical Engineers. "The Possibilities of a Cross-Channel Power Link," by D. P. Sayers, M. E. Laborde and F. J. Lane.

The Polytechnic, Regent Street, 7.30 p.m. Institute of Welding, North London Branch. Annual general meeting.

4, Grosvenor Gardens, 6 p.m. Institute of Metals, London Local Section. Annual general meeting followed by a discussion.

MANCHESTER.—College of Technology, Sackville Street, 7 p.m. British Institution of Radio Engineers, North-Western Section. Technical films.

NOTTINGHAM.—E.M.E.B., Smithy Row, 6 p.m. I.E.S. Nottingham Centre. "Lighting at Home and Abroad," by A. D. Charters.

PETERBOROUGH.—Eastern Gas Board's Demonstration Theatre, Church Street, 7.30 p.m. Incorporated Plant Engineers, Peterborough Branch. "The Place of the Modern Engineer in the Modern World," by A. L. Berridge.

Friday, 2nd April

BIRMINGHAM.—Regent House, St. Philip's Place, Colmore Row, 6 p.m. I.E.S. Birmingham Centre. "Television Studio Lighting," by D. C. Lightbody.

LONDON. — Victoria Halls, Bloomsbury Square, 7.30 p.m. I.E.E. London Students' Section. Spring dance.

Dorchester Hotel, W.1. Television Society. Annual dinner.

Savoy Hotel, W.C.2. Scientific Instrument Manufacturers' Association. Annual dinner and dance.

Connaught Rooms, Great Queen Street, W.C.2. Association of Supervising Electrical Engineers. Annual dinner and reunion.

NEWCASTLE-UPON-TYNE.—Liberal Club, 7 p.m. I.E.E. North-Eastern Centre. Informal meeting.

NOTTINGHAM.—Welbeck Hotel, 8 p.m. Institution of Works Managers, Notts and Derby Branch. Annual general meeting.

SHEFFIELD.—Royal Victoria Station Hotel, 7.30 for 8 p.m. I.E.E. Sheffield Sub-Centre. Annual dinner-dance.

AUSTRALIAN ELECTRICAL NEWS

From a Correspondent

THE State Electricity Commission of Victoria recently raised £3,150,000 of the £4,250,000 it sought, or almost 75 per cent of its objective; this was the largest amount obtained by the S.E.C. or any other State authority for nearly two years. The Queensland Electricity Commission has had outstanding success with its £500,000 loan, total subscriptions exceeding the amount sought by about £120,000.

In a report covering the five months to 30th June last, the directors of the Southern Electric Authority, Queensland (formerly the City Electric Co., Ltd.), state that installed plant should never again fall behind the peak demand on the system. The new 10,000 kW plant near Ipswich has been brought into service, and the first 30,000 kW section of the new generating station at Bulimba "B" is also in operation, with a further 30,000 kW unit scheduled for completion in 1954. Surplus on operations for the five months was £40,606. During the period the authority raised £2,209,011 by public issues—two electricity loans of £500,000 each, and an issue of £1,209,011 in variable interest stock.

The Commonwealth Government has agreed to admit New South Wales and Victoria as full partners in the Snowy Mountains project.

A recent report of the Defence Standards Laboratories shows that the work carried out has included the development of electronic equipment including a two-channel oscilloscope for the recording of pressure/time curves in explosives research; the designing of a high-sensitivity switch with an a.c. bridge to provide precision temperature control in an oven; and the development of a microwave spectrograph for investigations in the analysis of the molecular structure of gases.

Belgian Railway Electrification

Work is proceeding on the electrification of the Brussels–Ostend, Brussels–Liege and Brussels–Namur sections of the Belgian State Railways and electric train services have recently begun between Brussels and Ghent. It is, however, unlikely that two parallel Namur–Luxembourg lines will now be electrified, since these traverse less populated areas.

FACTORY EQUIPMENT EXHIBITION

Increased Display of Electrical Apparatus

THE second National Factory Exhibition which is being held this week by the *Factory Manager* and the *Factory Equipment News* is double the size of last year's function and occupies both of the Royal Horticultural Society's halls at Westminster. A wide range of electrical apparatus is represented and many new techniques are demonstrated.

Applications of electricity to industrial heating are a particularly interesting feature of the British Electrical Development Association's stand where attention is drawn to infra-red heating for drying Viskring seals for bottle tops, the use of resistance heating for the treatment of enamelled badges, and the employment of high-frequency induction heating for the hardening of small parts, soldering and brazing. Industrial lighting fittings shown on the same stand suitable for the use of blended lighting (fluorescent and tungsten) and colour-matching lamps are supported by photographic enlargements of typical factory lighting installations utilizing modern electrical units.

The British Thomson-Houston Co., Ltd., is also displaying lamps and lighting equipment with special emphasis on the Mazda " New Warm White " fluorescent lamp, which gives up to 22 per cent more light than its predecessor and has an improved colour appearance. Industrial fittings include many new fluorescent reflector fittings, the latest flameproof fluorescent fitting, a blended light unit, and a special industrial high bay fitting. Among other B.T.H. exhibits are motors for every kind of industrial duty with associated control gear, geared motor units, and the " Clearcall " industrial communication system.

A display of Crompton Parkinson squirrel-cage induction motors of the " Klosd " (totally enclosed) type complies with the new British Standard standardizing outputs, shaft sizes and fixing dimensions. Accompanying them are instruments including recent additions to the extensive range of switchboard types for the indication of volts, amperes, watts, and cycles.

Considerable attention has been given to mechanical handling equipment. Teleflex Products, Ltd., demonstrate their dual directional chain conveyor and an overhead cable conveyor, while on the stand of Gandley, Ltd., can be seen the application of fan equipment for pneumatic conveying, as well as for dust extraction and collection, ventilation, plenum heating, drying, etc. Vibro electric equipment for conveying, feeding, sifting, consolidating, etc., is shown by Podmores (Engineers), Ltd., another type of handling equipment being represented by battery electric industrial trucks, tractors, etc., displayed by Brush Coachwork, Ltd. Apart from an automatic string tying machine the Croxted Manufacturing Co., Ltd., demonstrates the " Simco " static eliminator for printing and textile machines.

Vacuum cleaning plants are also well represented. The Sturtevant Engineering Co., Ltd., shows various sizes of its cleaners as well as portable dust blowers for cleaning inaccessible places, electric motors, etc.; a " Uniclone " dust collector for use on individual machines and where a composite dust extraction plant is impracticable; an electrostatic air filter; and an axial flow fan for general ventilation. Apart from cleaning and normal blowing equipment the Service Electric Co., Ltd., shows hot air equipment, sirens and sound signals. Several types of Tellus and New Welbeck industrial cleaners are on view.

The importance of communications in offices and factories is emphasized by the numerous displays of private telephone equipment, telephone amplifiers, inter-office loudspeaking telephones, staff locators, sound recording and public address equipment. Among the exhibitors of this class of apparatus are Televox, Ltd., Dictograph Telephones, Ltd., Modern Telephones (Gt. Britain), Ltd., Central Rediffusion Services, Ltd., M. & L. Haycroft, Ltd. and Sterdy Telephones, Ltd., the last mentioned company also showing electric door locks. Apart from telephone systems, Standard Telephones & Cables, Ltd., display fire alarm systems and " Stanelco " equipment for soldering, brazing, annealing and hardening.

Time recorders are specialized products of the General Signal & Time Systems, Ltd., and Blick Time Recorders, Ltd. Various items of office equipment are exhibited by the Addressall Machine Co., Ltd., Fordigraph Sales (spirit reproducers), Burroughs Adding Machine, Ltd., and the National Cash Register Co., Ltd.

The exhibition closes at 7 p.m. this evening.

Plastic Conduit and Fittings

A CONDUIT tube made from p.v.c. which can be used for electrical installations, or parts of installations, where severe corrosive conditions exist is now available from the General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2. It is resistant to the majority of acids, unaffected by moisture or damp, oil or grease, and may be buried in the ground, lime, mortar or cement. It is lighter than steel or aluminium, is non-inflammable, does not split or fracture, and remains rigid in temperatures up to 140 deg F.

The constituents of the tube are so balanced as to enable it to be manipulated and handled like steel conduit so that the wireman does not have to learn a new technique. Bends and sets can be made cold in the normal type of bending machine used by electricians and no heating is required, although a bending block is not recommended as this would produce flattening. Threads can be cut with ordinary screwing tackle and no special dies need be kept for the purpose. So far as limits and size are concerned the tubing conforms to B.S. 31. When p.v.c. tube is used a separate earth wire must be run to ensure satisfactory continuity. When it is supported by saddles these should be placed at closer intervals than for steel.

The standard G.E.C. range of malleable iron or pressed steel conduit fittings can be used with this tube but first need treating in one or two ways. The fittings can be coated with p.v.c., which gives the user a completely protected system with a uniform resistance to corrosion throughout the installation. Fittings so finished, however, have to be specially prepared at an extra cost.

The alternative, which involves a lower increase in cost, is to paint the fittings with a special coating of chlorinated rubber which is highly resistant to alkalis and unaffected by acids, sea or fresh water, alcohol, animal, vegetable or mineral oils and petrol. It is also stable with such oxidizing agents as nitric acid. Delivery of fittings finished to this specification can be made in two or three weeks. The chlorinated rubber paint can be supplied separately in quart, ½ gall and 1 gall cans, together with suitable thinners when required. The completed installation can then be touched up and all joints sealed with this medium to ensure a satisfactory installation.

These finishes enable the whole range of G.E.C. fittings and accessories to be used with the p.v.c. conduit tube and thus ensure complete, efficient and satisfactory installations. The p.v.c. tube complies with I.E.E. Regulations Nos. 1301/5, 11th edition, for non-metallic conduit.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 5th May from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1950

8885. Rawsthorne, L. B. (trading as Risborough Service & Filling Station).—Electrical control system for controlling the operation of a liquid dispensing apparatus such as a petrol pump in conjunction with a till or register. 11th April, 1951. (708621.)

12516. Marconi's Wireless Telegraph Co., Ltd.—Thermionic valve amplifiers, modulators and repeaters. 8th December, 1950. (708246.)

13460. Western Electric Co., Inc.—Electric signal amplifying arrangements employing semi-conductor devices and transmission systems utilizing them. 30th May, 1950. (708247.)

15736. Western Electric Co., Inc.—Cold cathode gaseous discharge devices. 23rd June, 1950. (708424.)

19927. Welding Controls, Ltd., and Townsend, P. W.—Resistance welding electrodes. 3rd August, 1951. (708624.)

23791. Kingston Instrument Co., Ltd.—Magnet devices. 10th September, 1951. (708333.)

30699. Wickman, Ltd.—High-frequency electric induction heating. 14th December, 1951. (708630.)

30859. Communications Patents, Ltd.—Methods of and apparatus for induction heating of metal members. 19th March, 1952. (708427.)

1951

1195. Philips Electrical Industries, Ltd.—Electric discharge tubes for use at extremely high frequencies. 16th January, 1951. (708429.)

2195. British Electricity Authority and Hodgkinson, A. J.—Water screening devices or plant. 23rd January, 1952. (708532.)

3827. North Midlands Engineering Co., Ltd.—Supporting means for cables and the like. 8th February, 1952. (708534.)

4436. English Electric Co., Ltd.—Systems for supporting electrical apparatus in cubicles. 8th February, 1952. (708535.)

4501. Hivac, Ltd.—Gas-filled electric discharge tubes. 25th February, 1952. (708636.)

5004. General Electric Co., Ltd., and Faithfull, P. J. F.—Electronic valve amplifiers. 17th January, 1952. (708637.)

5129. Pye, Ltd.—Electron microscopes. 30th May, 1952. (708434.)

7828. General Electric Co., Ltd., Bayliss, A. J., Bloch, A., Fisher, F. J., and Hunt, G. J.—Apparatus of the kind for measuring electrical impedance or a characteristic dependent upon electrical impedance. 2nd April, 1952. (708536.)

8975. Telegraph Construction & Maintenance Co., Ltd.—Telecommunication cables. 8th April, 1952. (708641.)

10390. Allmanna Svenska Elektriska Aktiebolaget.—Means for controlling the speed of electric motors. 3rd May, 1951. (708267.)

10509. General Electric Co., Ltd., Fisher, F. J., and Hunt, G. J.—Apparatus for measuring electrical power at high frequencies. 24th April, 1952. (708538.)

12759. Hobourn Aero Components, Ltd.—Electric heating elements. 24th September, 1951. (708542.)

14187. Thermoset Appliances, Ltd., and Douce, N.—Temperature controls for electrically heated blankets, pads and bed-warmers. 16th June, 1952. (708274.)

14373. Philips Electrical Industries, Ltd.—Velocity modulation tubes of the kind comprising a drift space. 18th June, 1951. (708276.)

15460. English Electric Co., Ltd.—Magnetic brakes for instruments of the rotating induction disc type. 13th June, 1952. (708443.)

15535. Prototypa, Narodni Podnik.—Control systems for electric motors. 29th June, 1951. (708280.)

15800. Carr Fastener Co., Ltd.—Sockets for starting switches for fluorescent discharge lamps. 26th June, 1952. (708650.)

16440. Murphy Radio, Ltd.—Interference suppression in television receivers. 11th July, 1952. (708549.)

16652. English Electric Co., Ltd.—Electric welding. 27th June, 1952. (708656.)

17684. Maruwa Seiki Kabushiki Kaisha.—Automatic resetting devices for electric clocks. 25th July, 1951. (708287.)

17874. British Thomson-Houston Co., Ltd.—Electric circuits. 26th June, 1952. (708290.)

18497. Siemens-Schuckertwerke-Akt.-Ges.—Synchronous electric switches. 3rd August, 1951. (708293.)

20808. Ferranti, Ltd.—Rectifying apparatus. 4th September, 1952. (708296.)

22099. Marconi's Wireless Telegraph Co., Ltd.—High-stability d.c. amplifier circuit arrangement. 19th May, 1952. (708299.)

22287. Pamphonic Reproducers, Ltd., and Marriott, P. A.—Magnetic recording apparatus. 23rd September, 1952. (708300.)

22327. Vogt, A.—Electrodes for photo-electric devices. 24th Sept. 1951. (708449.)

22627. Claude-General Neon Lights, Ltd., and Symmonds, E. T.—Illuminated box signs. 26th September, 1952. (708302.)

23158. Metropolitan-Vickers Electrical Co., Ltd.—Electrical pulse-generating circuits. 28th August, 1952. (708305.)

23286. Telefonaktiebolaget L. M. Ericsson.—Connecting devices for automatic telephone exchanges for emitting subscriber calling signals. 5th October, 1951. (708450.)

23484. Automatic Electric Laboratories, Inc.—Telephone key and like switches. 9th October, 1951. (708451.)

25345. British Thomson-Houston Co., Ltd.—Permanent magnet clutches or brakes. 30th October, 1951. (708557.)

25462. Westinghouse Brake & Signal Co., Ltd., and Martin, C. A.—Battery charging apparatus. 24th June, 1952. (708667.)

25930. Philips Electrical Industries, Ltd.—Photographic flash bulbs. 6th November, 1951. (708457.)

26085. Steatit-Magnesia Akt.-Ges.—Magnetic cores for high frequency coils. 7th November, 1951. (708460.)

26484. Soc. Anon. des Usines Chausson.—Electromagnetically operated compressors. 12th November, 1951. (708668.)

27202. International Aeradio, Ltd., and Jucker, J.—Electromagnetic relays. 20th November, 1951. (708464.)

28324. English Electric Co., Ltd.—Time base deflection amplifier circuits. 5th August, 1952. (708366.)

30198. Philips Electrical Industries, Ltd.—Circuits for carrier-wave telephone stations. 27th December, 1951. (708467.)

1952

801. British Thomson-Houston Co., Ltd.—Electromagnetic waveguides. 29th October, 1952. (708671.)

2220. Sihn, W.—Electric plugs. 28th January, 1952. (708468.)

2830. Premier Electric Heaters, Ltd.—Electrically heated kettles. 2nd February, 1953. (708571.)

6854. Standard Telephones & Cables, Ltd.—Electric current control devices. 17th March, 1952. (708687.)

7131 & 7526. British Insulated Callender's Cables, Ltd.—Sealing terminations for electric cables. 19th June, 1953. (708318 & 708320.)

7842. Crabtree & Co., Ltd., J. A., and Hill, W. E.—Electric fuse holders. 18th March, 1953. (708321.)

8213. Dorman & Smith, Ltd.—Electric fuses. 26th March, 1953. (708689.)

8318. Automatic Electric Laboratories, Inc.—Multi-frequency generators. 1st April, 1952. (708388.)

8529. Philips Electrical Industries, Ltd.—Devices for amplitude-modulation of ultra-short waves. 3rd April, 1952. (708580.)

8977. Electro-Mecanique de l'Aveyron.—Electric brakes. 8th April, 1952. (708390.)

9961. British Thomson-Houston Co., Ltd.—Electric-discharge devices. 21st April, 1952. (708325.)

10019. Landis & Gyr Akt.-Ges.—One-piece spring snapper for an electric switch. 21st April, 1952. (708326.)

10050. Bayley, J. W.—Apparatus for generating electricity from water power. 21st April, 1953. (708691.)

10533. Yardney International Corporation.—Separators for the electrodes of electric batteries and accumulators. 25th April, 1952. (708330.)

10991. Aircraft-Marine Products, Inc.—End closures in sleeve-type insulation for electrical elements. 1st May, 1952. (708695.)

11147. Standard Telephones & Cables, Ltd.—Attenuators for high frequency transmission lines. 2nd May, 1952. (708589.)

13411. British Thomson-Houston Co., Ltd.—Kitchen waste disposal apparatus. 27th May, 1952. (708398.)

13412. British Thomson-Houston Co., Ltd.—Heat exchangers. 27th May, 1952. (708399.)

14955. Standard Telephones & Cables, Ltd.—Support for microwave transmission lines. 13th June, 1952. (708596.) 14956. Radio frequency filter. 13th June, 1952. (708597.) 14957. Crystal holders for use in electrical circuits. 13th June, 1952. Additions to 704050. (708598.) 16252. Couplers for microwave transmission systems. 27th June, 1952. (708600.) 16253. Microwave wire and cable. 27th June, 1952. (708601.)

15343. Philips Electrical Industries, Ltd.—Capacitors. 18th June, 1952. (708404.)

18450. Nield's Patents, Ltd.—Electric insulators. 6th July, 1953. (708606.)

19748. General Motors Corporation.—Control mechanism for reversible electric motors. 6th August, 1952. (708414.)

25215. Philips Electrical Industries, Ltd.—Superheterodyne receivers for frequency-shift telegraphy. 8th October, 1952. (708618.)

25635. Aktiebolaget Enkopings Verkstader.—Electrically heated hot air or steam bath apparatus. 13th October, 1952. (708504.)

28386. Scintilla, Ltd.—Portable cutting machines. 11th November, 1952. (708619.)

29946. Electrolux, Ltd.—Absorption refrigerating apparatus. 26th November, 1952. (708515.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—BRISBANE.—26th May. State Electricity Commission for Queensland. 66 kV transformers for the Capricornia and Townsville Regional Electricity Boards. (E.S.B. 6826/54. Ten/8666.)*

30th April. City Council. Twenty-four 33 kV airbreak switches. (E.S.B. 6701/54. Ten/8643.)*

Billericay.—U.D.C. Street lighting equipment. (See this issue.)

Bromley.—12th April. Corporation. Street lighting equipment. (See this issue.)

Canada.—SASKATOON.—31st March. City Electrical Department. Two circuit breakers. (E.S.B. 6912/54. Ten/8653.)*

Castle Ward (Northumberland).—3rd April. R.D.C. Electrical installation in 54 houses at Heddon. Mr. G. Edgar-Dimmack, surveyor, North Road, Ponteland.

Durham.—3rd April. County Education Committee. Equipment and machinery including electrical engineering laboratory equipment for the new technical college, Hebburn. A. A. Denholm, director of education, Shire Hall.

Eccles.—3rd April. Corporation. Electrical installations in 306 dwellings. (See this issue.)

Edinburgh.—North of Scotland Hydro-Electric Board. 33 kV switchgear for Mybster substation. (See this issue.)

Egypt. — CAIRO. — 20th April. Cairo Electricity and Gas Administration. 25,000 50 c/s watt-hour meters. (E.S.B. 7279/54. Ten/8694.)*

Formosa. — TAMSUI. — 13th April. Taiwan Power Co. Electrical, telephone and elevator equipment. (E.S.B. 6469/54. Ten/8651.)*

Gateshead.—26th April. Corporation. Electrical installation in Leam Lane primary school. (See this issue.)

Huddersfield.—9th April. Borough Council. Passenger lifts for Town Hall. Borough architect, High Street Buildings.

India. — NEW DELHI. — 8th April. Directorate General of Supplies and Disposals. H.f. radio transmitter-receiver sets, test equipment and spare parts. (E.S.B. 6837/54. Ten/8663.)* 9th April. Signalling cable. (E.S.B. 6835/54. Ten/8664.)*

Irish Republic.—2nd April. Monaghan County Council. Two electrically operated pumping units, with accessories, for water supply at Glaslough. P. H. McCarthy & Sons, consulting engineers, 26, Lower Leeson Street, Dublin. (E.S.B. 7060/54. Ten/8674.)*

Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

Manchester.—10th April. Education Committee. Electrical engineering equipment for extension to the Municipal College of Technology. (See this issue.)

Newcastle-on-Tyne. — 21st April. City Council. Electric washing machines and mangling machines at the laundry to be provided at the new Hindhaugh Street block of flats (120 dwellings). City architect, 18, Cloth Market.

New Zealand.—WELLINGTON.—13th June. State Hydro-Electric Department. Two 312·5 kVA water-turbine driven generating sets. (E.S.B. 6592/54. Ten/8631.)*

Rowley Regis.—5th April. Corporation. Street lighting equipment. (See this issue.)

South Africa.—CAPE TOWN.—2nd April. Provincial Administration, Cape of Good Hope. Deep therapy unit. (E.S.B. 6003/54. Ten/8620.)*

JOHANNESBURG. — 14th April. Stores Department, South African Railways. Overhead equipment. (E.S.B. 6680/54. Ten/8645.)*

United States.—DENVER, COLORADO. —30th March. Department of the Interior, Bureau of Reclamation. Main control and distribution boards and battery charger for Maricopa and Casa Grande substations, Davis Dam project, Arizona/Nevada. (E.S.B. 6624/54. Ten/8637.)* 13th April. Unmounted switchboard equipment and carrier-current equipment. (E.S.B. 6620/54. Ten/8638.)*

PORTLAND.—6th April. Bonneville Power Administration. 50,000 kVA transformer. (E.S.B. 7229/54. Ten/8693.)*

Uruguay.—MONTEVIDEO.—20th April. Ministerio de Salud Publica. Electrical material, including insulators, wire, cable, switches, circuit breakers, lamps, lighting fittings and accessories, irons, stoves, etc. (E.S.B. 6854/54. Ten/8659.)*

ORDERS PLACED

Darlington.—Corporation. Second part of the scheme for improving the lighting in Coniscliffe Road (£4,895).—North Eastern Electricity Board.

Deal. — South East Metropolitan Regional Hospital Board. Reconstruction of the electrical services at the Victoria, Deal and Walmer Memorial Hospital (£1,108).—G. E. Wallis & Sons (Electrical).

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Acton.—Factory, Coronation Road area; Sant Sturgess, Ltd., stainless steel craftsmen, 9–11, Standard Road, N.W.10.

Aveley. — Health centre (£35,000); county architect, County Hall, Chelmsford.

Barking. — Garage for commercial vehicles in Highbridge Road; Mountfield Transport & Engineering Co., Ltd., haulage contractors, 241, High Street, E.6.

Barnet.—Additions to South Herts College of Further Education, Wood Street (£57,300); county architect, County Hall, Hertford.

Bishop's Stortford.—Municipal offices and public hall, Town Meads; G. N. Drinkwater, clerk to U.D.C., Council House.

Boston.—Houses (100), Woad Farm estate; borough architect.

Bourton-on-the-Water.—Houses (24) for North Cotswold R.D.C.; Thomas Rayson, architect; 29, Beaumont Street, Oxford.

Brighton.—Police houses and firemen's cottages; borough engineer and surveyor, 26–30, King's Road, Brighton.

Bristol.—Methodist church, Gloucester Road; L. R. Edwards, architect, 37, Oakfield Road.

Carlisle.—R.C. church, Edgehill Road; W. C. Mangan, architect, 2, Ribblesdale Place, Preston, Lancs.

Cheltenham.—Houses (146), Pirton Lane, Churchdown; E. H. Rosser, R.D.C. surveyor, 14, Imperial Square.

Chichester.—Special day school for educationally sub-normal children (£44,500); West Sussex county architect, County Hall, Chichester.

Colwyn Bay.—Three blocks of 3-storey flats, Glyn estate; T. Alun Hughes, Ltd., Hillside Yard, Llannerch Road.

Crayford.—First stage of secondary school, Slade Green; county architect, County Offices, Springfield, Maidstone.

Dartford.—Operating theatre, West Hill Hospital; North East Metropolitan Regional Hospital Board, 11, Portland Place, London, W.1.

Deal.—Houses (26), St. Martins Road estate; borough surveyor, Municipal Offices, Queen Street.

Derby.—Congregational church, Enfield Road; A. Percy Taylor, architect, 59, Chapel Street, Belper.

Douglas (I.O.M.).—Factory, Mills Meadow site; Douglas Calder, architect, Murray House.

Dronfield. — Dwellings (52), Green Lane; Dronfield Pioneer Health & Housing Society, Ltd., 7, Paradise Square, Sheffield.

Durham.—X-ray department at Dryburn Hospital (£22,000); E. Gilderoy, builder, Allergate, Durham.

Ellesmere Port.—Fire station; county architect, Shipgate Street, Chester.

Finchley.—Offices and showrooms in High Road; F. & H. Joyce, Ltd., 117, High Street, Barnet.

Gateshead.—Additions to Parkside Confectionery Works, Liddle Terrace; L. K. Pallister, architect, 68, Fern Avenue, Jesmond, Newcastle-on-Tyne.

Additional storey at factory of Simons, Ltd., Oakwellgate; C. Soloman, St. Mary's Place, Newcastle-on-Tyne.

Halifax.—Crematorium, administrative building, houses, electricity substation, etc., at Park Wood; borough engineer, Crossley Street.

Harrogate.—Erection of married soldiers' quarters at Knaresborough Road; Jackson & Calvert, architects, 3, Raglan Street.

Harrow.—Laboratories; Kodak, Ltd., Elmgrove Road.

Haywards Heath.—Admission villa, St. Francis' Hospital; L. M. Gotch & Partners, architects, 8, City Road, E.C.1.

Hebburn-on-Tyne. — Block of flats, Carr Street; U.D.C. surveyor.

Leicester.—Shops (26) and maisonnettes (22), Eyres Monsell estate; city architect.

Liverpool.—Dwellings (3,511), Kirkby estate, at a cost of £4,822,510; Unit Construction Co., Ltd., Speke Boulevard, Liverpool.

London.—MARYLEBONE.—Luxury flats (32), Seymour Place; Kirk & Kirk, Ltd., builders, Atlas Works, S.W.15.

STEPNEY.—R.C. primary school, Commercial Road; Sterrett & Blouet, architects, 3, Ashley Place, S.W.1.

Maidstone.—Large extensions to departmental stores in Faith Street; T. C. Dunning & Son, Ltd., drapers and furnishers, 69, Week Street.

Mansfield Woodhouse. — Factory, Leeming Lane South; Mansfield Shoe Co., Ltd., Dallas Street, Mansfield.

Middlesbrough.—Rebuilding of stores in Linthorpe Road for E. Upton & Son; Thomas A. Crawford, architect, 80, Borough Road.

Newcastle-on-Tyne.—Psychiatric unit at the General Hospital for Newcastle Hospital Board; Scherrer & Hicks, architects, 19, Cavendish Square, London, W.1.

Extensions to cigarette factory, Bath Lane, for John Sinclair & Co., Ltd.; J. Walton Taylor & Son, Gallowgate, Newcastle.

Northampton.—Factory for S. Wresford & Sons, Ltd.; H. C. R. Frost, architect, 44, Guildhall Street.

Portsmouth. — Houses (78), Leigh Park; city architect.

Rainham (Essex). — Houses (112), Whybridge Farm estate; K. I. Joseph, surveyor, 288, High Road, Ilford.

Reading.—Secondary modern school, Burghfield (£104,140); Berks county architect, Wilton House, Parkside Road, Reading.

Scarborough.—Church and parsonage, off Westway; F. W. Johnson, architect, 16, High Street, Bridlington.

Scunthorpe.—Bungalows for single persons, Riddings and Church Farm estates; borough architect.

Sevenoaks.—Houses (186); R.D.C. surveyor, Inglewood, Oak Hill Road.

Sheffield.—Duke Street redevelopment scheme (Phase 1); Ove Arup & Partners, Ltd., consulting engineers, 8, Fitzroy Street, London, W.1.

Flats, Greenhill-Bradway estate; Liversidge Reinforced Concrete Engineering Co., Ltd., 31A, John Adam Street, London, W.C.2.

Smethwick.—Second stage extensions, Chance Technical College; W. W. Atkinson, architect, 4, Verulam Buildings, London, W.C.1.

Extensions at Holly Lodge Girls' Grammar School; F. L. Randle, architect, Lloyds Bank Chambers, 116, High Street, Smethwick.

Southport.—Factory extension; Hartwood Hosiery Co., Ltd., Rufford Road.

Stockton-on-Tees.—Library, Redhill Road (£11,500); borough architect, 28, The Square.

Preserves factory, Yarm Road, for C.W.S., Ltd.; C.W.S. Architects' Dept., 90, Westmorland Road, Newcastle-on-Tyne.

Proposed warehouse and offices for Goodyear Tyre & Rubber Co.; Wright & Mason, architects, Castle Meadow, Norwich.

Single persons' houses (32), Londonderry Road; borough architect, 28, The Square.

Sunderland. — Factory extension; National Galvanisers, Ltd., Pallion Road.

Extension of Thompson Park Day School (£10,000); borough architect, Town Hall.

Swadlincote. — Houses (56), Hartshorne estate; Rice & Beck, Ltd., Nottingham Road, Attenborough, Nottingham.

Swansea.—Showrooms and offices, City Centre; Swears & Wells, Ltd., Oxford Street, London, W.1.

Tamworth.—Ambulance station and police houses, Wiggington Road; T. H. Evans, clerk to the County Council, County Buildings, Stafford.

Tewkesbury.—Dwellings (40), Oldfield Barton Road; Rainger, Rogers & Smithson, architects, 29, Rodney Road, Cheltenham.

Thatcham.—Secondary modern school (£127,890); Berks county architect, county offices, Wilton House, Parkside Road, Reading.

Uppingham. — Houses for R.D.C., Leicester Road site; Browning Bros., Main Street, Humberstone, Leicester (£13,058) and W. E. Barnett, Uppingham, Rutland (£16,845).

Wallsend.—Fabricating shed, 300ft by 85ft, for Clelands (Successors), Ltd., shipbuilders; Austin & Son, contractors, Dewsbury.

Waltham.—Extensions to Toll Barr Secondary School; R. W. Brown, architect, 31, Osborne Street, Grimsby.

Warrington.—Technical college, Long Lane; G. & J. Seddon, Ltd., Little Hulton, nr. Bolton (recommended).

Watford.—Industrial premises, Holywell estate; Mackay Transport, Ltd., 36, Queen Mary's Avenue.

Wellington (Salop).—Houses (107), Overdale estate, Ketley, for R.D.C.; James Hickman & Son, architects, 1, Market Place, Wellington, Salop.

West Bridgford (Notts).—New housing estate for Arthur Short Estates Co.; Cecil Howitt & Partners, architects, St. Andrews House, Nottingham.

West Ham.—Dwellings (40), Charlford Road; borough architect.

West Hartlepool.—Extensions to the General Hospital; P. H. Knighton, "Dunira," Osborne Road, Newcastle-on-Tyne.

West Hendon.—Office block, Edgware Road; Poolman, Ltd., Quadrex House, Park Lane, London, W.1.

York.—Science block at Mount School, Driffield Terrace; Fred Rowntree & Son, architects, 120, The Mount, York.

DANISH ELECTRICAL TRADE

Reduced Exports in 1953

DENMARK's exports of electrical goods last year declined in value by about Kr. 6 million while imports rose by approximately Kr. 8 million, the total values being: exports Kr. 137,747,000 and imports Kr. 123,321,000. The chief items in 1953 with notes of increases or decreases on 1952 are shown in the accompanying table.

There has been appreciable expansion for some years in Danish manufacture of electrical goods, particularly cable and wire, motors, vacuum cleaners and radio apparatus. At the same time the extension of supply of electricity, notably to Copenhagen and Zealand, should favourably influence import trade in the more advanced types of electrical manufactures for agriculture, industry and homes.

The principal supplying countries for electrical goods to Denmark last year were West Germany, Sweden, the Netherlands and the United Kingdom, while the leading customer countries were Sweden, Norway, the Netherlands and Finland. (Kr. 19·35 equals £1.)

Class of Goods	Exports		Imports	
	1953 Kr. (000)	Inc. or dec. on 1952 Kr. (000)	1953 Kr. (000)	Inc. or dec. on 1952 Kr. (000)
Dynamos, motors, convertors, etc.	29,752	+ 11,708	19,557	+ 1,278
Battery parts	12,911	+ 1,742	1,147	+ 352
Incandescent lamps	390	— 668	7,328	+ 821
Radio transmitters and navigation apparatus	4,818	+ 3,365	10,031	+ 1,465
Radio valves	184	+ 1,239	3,079	— 1,123
Radio receiving sets	3,892	— 1,988	1,864	+ 1,738
Parts for radio receiving sets	10,730	— 5,943	3,797	+ 87
Telegraph and telephone material	1,380	— 646	23,209	+ 5,039
Cable and wire	12,052	— 4,685	3,708	— 4,094
Electrical heating apparatus	1,056	+ 469	4,077	+ 2,394
Vacuum cleaners, etc.	9,172	+ 1,105	2,627	+ 1,216
Electric signalling and alarm apparatus, etc.	8,291	+ 431	4,743	+ 87
Electromedical and Röntgen apparatus	2,861	+ 226	3,631	— 101
Electrical material unspecified	39,690	— 8,128	26,078	— 2,008